B-Cub System

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TSS B-CubMaster

Outline Operational Manual

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Introduction

This document details the use of the TSS B-CubMaster. It is written assuming a basic understanding of the B-Cub system, please contact TSS Lighting Control Systems for more information should this not be the case.

Software Overview

The software within the B-CubMaster is designed primarily for tunnel use. In a typical application, the B-CubMaster will primarily monitor an input from a photometer, through an isolated converter, and compare the reading with user-set values to determine which groups of B-Cubs are to have their lamps switched on/off. This is achieved by assigning each B-Cub a group number using its onboard binary switch, and the B-CubMaster sends strings containing group on/off information. The group switching information is set for each stage, and can be altered at any time.

In the event of a photometer failure (generated through reading either an out of range, or a static input value for a set period), the B-CubMaster can revert to a backup photocell and run an emergency day or night stage depending on the photocell state. In the case of a photocell fault or indeed not present, this emergency day/night stage switching is governed by dawn/dusk times set by the operator.

The B-CubMaster is capable of accommodating an internal GSM modem, to allow remote connections for emergency override, to assist in commissioning or to download staging and error logs. This TSS-supplied modem is automatically configured by the B-CubMaster upon connection. The configuration strings can be altered within the *Configuration* > *Modem* screens.

The internal memory stores stage change information and relevant system events/errors. This information can be displayed on the LCD, but is best viewed on a PC after a remote connection download. Lamp burn hours are stored in a similar manner, and can be viewed as stage hours run or lamp group burning time.

Lighting Regimes

The B-Cub system allows for up to six completely different lighting regimes to be configured for a single installation, plus default “All (lamps) On” and “All (lamps) Off” regimes. The reason for these interchangeable regimes is to allow completely different lighting designs to be selected, for seasonal or more likely contraflow traffic situations. Each regime can have the following exclusive parameters set:

- Unique 12-character name.
- Up to 32 photometer level-controlled lighting stages (user sets Cd/m² ranges for each stage).
- Decide how many of the 32 separate lamp groups are switched in each of the above stages.

In addition to the above information, a generic backup day & night stage can be chosen, selected in the event of a photometer failure. Timers can be set for the following:

- Load shedding time: - Time span across which all of the lamps switching on or off at any given point will switch.
- Transition time: - After a stage is activated this allows any lamps switching ‘on’ time to burn-up before any lamps which are configured to be ‘off’ for that stage are switched. (Helps eliminate sharp drops in lighting levels on non-cumulative lighting designs.)
- Photometer wash wiper: - Configure the photometer wash/wipe to wash for x seconds every y hours.
- Photometer damping time: - Duration a photometer value must remain within a new lighting stages’ boundary before the change is activated.
- Photometer Fault timer: - Number of hours the photometer input is allowed to remain at the same level before registering as being faulty (and sounding the system alarm).
- Backup Daytime: - Specify when day/night backup stages are to run in the event of photometer (and photocell, if connected) failure.

The B-Cub

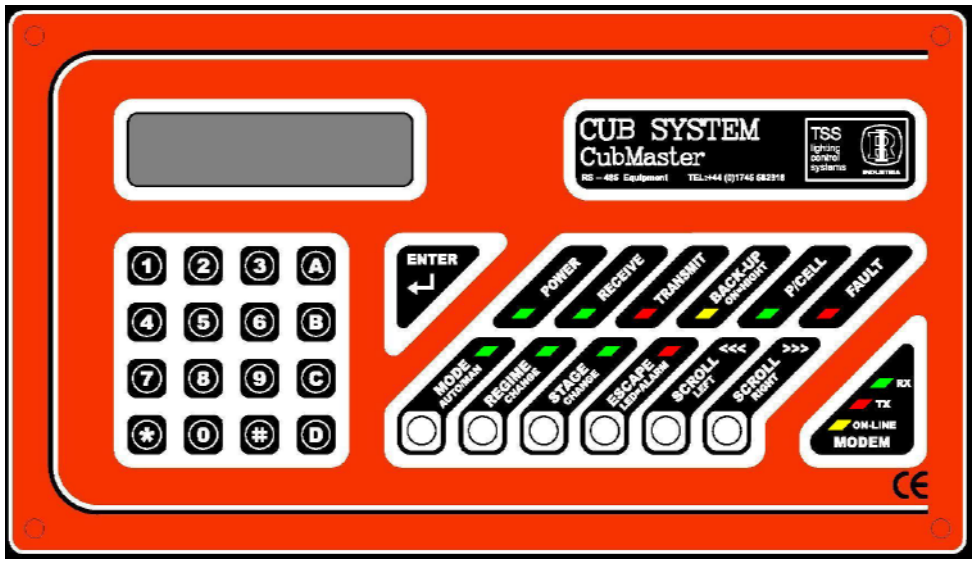
The B-Cub is the control unit, usually mounted in the luminaire body using an industry standard 11-pin base. Each B-Cub is capable of receiving & carrying out switching instructions, controlling loads up to 600W in power. In order to prevent large numbers of luminaires switching at once, *Load Shedding* is achieved by specifying (through the B-CubMaster) the time span across which all of the lamps switching on or off at any given point will switch. Upon receipt of a switching command, the B-Cub will wait, and switch after a randomly selected time delay between zero & the load shedding time maximum value (120 seconds).

The unit has a 5-bit address switch, which denotes which of the 32 possible lamp groups it belongs to. As the B-CubMaster traverses lighting stages throughout the day, it will command these groups to switch on & off based on the user-set staging information. Please see ***Annex 2: B-Cub Lamp Group Switch Settings*** at the back of this document for group / switch settings.

The button on the top of the B-Cub is for testing the load output. Simply press once to switch the output on, again for off. Please note that it is not possible to switch a B-Cub load off if it was switched on by a command from the B-CubMaster.

The B-CubMaster: Front Panel

Below is a picture of the B-CubMaster front panel. The 23 (16 alphanumeric & 7 function) buttons, 10 LED's and 16x2 character backlit LCD form the user-interface.



Front Panel LED's & Buttons

LED's

POWER (green): Steady on as long as mains is applied to the unit.
RECEIVE (green) & TRANSMIT (red): Flash when data is received / sent on the RS-485 bus.
BACK-UP ON = NIGHT (yellow): Lights when the daytime backup timers are active and denote that it is currently 'night'.
P/CELL (green): Lights when the photocell registers as being nighttime.
FAULT (red): A faulty photocell or photometer will cause this to light, as well as a configuration fault for a regime / stage range.

MODEM LED's These flash to indicate data transfer through the RS-232 serial port on the front of the unit.

Buttons

Depending on the operation mode of the unit, only certain buttons on the front panel will be active. Please see the following sections for information on which buttons are used in which mode.

Basic Operation

Under normal operation, the unit will be in automatic mode, denoted by the green *MODE AUTO/MAN* LED being lit. The LCD displays the name of the current lighting regime, along with the active lighting stage, and the present time. e.g.

CONTRAFLOW S01 10:04:42

Please note that pressing any active button at any time causes the backlit LCD to light for a short period.

Running in Automatic Mode

"Automatic mode" means that the system is functioning in a stand-alone manner, monitoring its photometer input and acting upon the values received, changing light levels in the tunnel accordingly.

From this state, only four buttons are functional to the user:

MODE AUTO/MAN

Pressing this button puts the B-CubMaster into manual mode. All automatic functions stop, and the user will have full control over the system. Once in manual mode, the user will be presented with the front of the menu system. Please see the section titled *Running in Manual Mode – Menu System* for more information. Press this button again to re-enter automatic mode, lamps will switch based on the selected regime & current stage.

REGIME CHANGE

Press this button to cycle through the available regimes (those that have been specified as 'Active' in the configuration menu). The display will flash, along with the LED on this button showing the pending change. Press *ENTER* to confirm the change, *ESCAPE* to cancel. Once a new regime has been chosen it will remain selected until the next manual intervention.

STAGE CHANGE

Similar to *REGIME CHANGE* previous, repeat-press this button to scroll through the configured stages for the current regime. Pressing *ENTER* will select the desired stage, causing the lamps to immediately switch to the relevant pattern. The display will flash the stage number to indicate the manual override, and remain in this state. To return the system to normal automatic operation, press this button until “Aut” is displayed on the LCD and press *ENTER*.

ESCAPE LED=ALARM

If the alarm is sounding on the unit (LED will be flashing), pressing this button will silence it. Please note that if the fault that caused the alarm to sound in the first place is still present, then the *FAULT* LED will also be lit. If the *FAULT* LED is not lit then the error is likely to have been cured.

Running in Manual Mode - Menu System

The menu system employed within the unit is designed to provide easy, logical access to the information and settings found within. To traverse between different menus & options, press the *SCROLL LEFT* and *SCROLL RIGHT* buttons. Once the correct menu or sub-menu has been found, simply press the associated number to access that option.

The buttons required for navigating the menus other than *SCROLL* are the alphanumeric keys, *ENTER* and *ESCAPE*.

Menu 1: History

1: System Log

View or clear the system log information, including stage changes and any errors. In view mode, use the *SCROLL* buttons to move through entries.

2: Burn Hours

View or clear lamp burning hour information. In view mode, use the *SCROLL* buttons to move through the different stage hours (stage 1-32) or lamp group hours (groups 0-31). To clear (zero) either of these options, the B-CubMaster will ask for confirmation by a press of the "#" key.

Menu 2: Switching

Contains commands for temporarily altering the current lighting pattern, or change the current regime here.

Please note that it is quite possible to switch to a stage or regime that has no lamp groups active, thus plunging the whole installation into darkness. TSS Lighting Control Systems cannot be held responsible for users in this event, and advise extreme caution in such a situation.

1: Lamp Groups

Once selected, a list of all available lamp groups is displayed ready for switching. The display will initially mirror the current lighting stage, but by typing a group number in & pressing the *ENTER* key, individual groups may be toggled on & off. As soon as a group is changed, the new data is sent to the B-Cubs immediately.

A "-" by a group number means that group is currently off, whereas a "*" denotes the group is on. Any alterations here are not saved, and when the B-CubMaster is put back into automatic mode, the lighting will revert to the saved pattern for the current stage.

2: Light Stages

By typing in the desired stage number, the B-CubMaster will set lighting levels based on the stored information for that stage. Users should be aware that the chosen stage may not be configured, and thus will switch the B-Cubs & lamps off, causing a potentially dangerous situation in a live installation.

3: Light Regimes

Select the number of the target regime from those displayed here. Using the *SCROLL* keys to navigate the list and type the number, followed by a "#" to confirm the change.

The chosen regime will now remain selected, and placing the B-CubMaster back into automatic mode will set lighting patterns based on this.

Menu 3: Alarm

This screen is purely for silencing a sounding alarm when in manual mode. Please note that this feature is the same as pressing the *ESCAPE / LED=ALARM* button on the front panel of a unit running in automatic mode.

In either of the above cases, the *FAULT* LED on the front panel will be lit (provided fault is still present), and remain lit until the fault is cleared.

Menu 4: Configuration

Contains all of the screens needed to set up the B-CubMaster. From here all of the parameters can be adjusted, new regimes and stages configured, set the time & date etc.

1: Regimes

This is where the optional different lighting regimes are set up. Firstly select the regime to edit from the list. The first six on the list may be fully configured whereas the last two, “Lamps Off” and “Lamps On” only offer the **Active** option. The four general configuration options are:

1: **Label** - Sets the unique name/reference for the selected regime. Input the name in by selecting an alphanumeric button (1-9, A, B, C, or D) then use the *SCROLL* keys to alter the character. The characters available are:
1-9 “ ”(space) # $ % & * + , - . = A-Z and a-z
To move on to a next character simply press another alphanumeric button. The ID can be up to 12 of the above characters long, press *ENTER* to store the new ID.

2: **Active** – Decides whether or not the selected regime will be available to choose from a press of the *REGIME CHANGE* button (whilst in automatic mode). Press the “#” key on here to confirm the regime is active and may be selected, or press the “*” key to disable the use of this regime.

3: **Candela Ranges** – This is used to set the band of photometer readings that pertain to each lighting stage. The first value to set is the *Low Limit*, usually “0000”, below which any readings from the photometer will generate an error. Press the right *SCROLL* key to view the range for lighting stage 1. Press *ENTER* and type a value e.g. “0150” then press *ENTER* again to store. The B-CubMaster will now run lighting stage 1 between zero and 150 Cd/m². Use the *SCROLL* keys to set the other stage ranges, entering the maximum value for that stage in a similar fashion every time until the highest stage and value is reached.

4: **Lamp Groups** – This is where the user specifies which lighting groups are to be switched on or off for each of the above stages. Firstly, type the required stage number and press *ENTER* to proceed. Type the number of the desired lamp group, 00 to 31, and press “*” to select that group ON for the current stage, “#” to specify it as OFF. A “-“ by a group number means that group will be off for that stage, whereas a “*” denotes the group will be on. Repeat the above for each desired group, and then press *ESCAPE* when done to return to the stage menu and type another number in to alter the next stage. Any alterations here are automatically saved, and when the B-CubMaster is put back into automatic mode, the lighting will adjust to reflect any changes.

2: Time

Sets the time within the B-CubMaster. Type the time in the specified format (hhmmss) then press *ENTER* to store new value.

3: Date

Sets the date within the B-CubMaster. Type the date in the specified format (DDMMYY) then press *ENTER* to store new value.

4: Timers

1: **Transition** - After a stage is activated this allows any lamps switching 'on' time to burn-up before any lamps which are configured to be 'off' for that stage are switched. (Helps eliminate sharp drops in lighting levels on non-cumulative lighting designs.) To alter, simply type a new value in (up to 999 seconds) and press *ENTER*.

2: **Load Shedding** - Time span across which all of the lamps switching on or off at any given point will switch. Upon receipt of a switching command, the B-Cub will randomly select a value between zero & the value set here to switch. To alter, type a new value (up to 120 seconds) then press *ENTER*.

3: **Wiper** – Select whether or not a photometer wash-wipe is used, and configure times here in the following 4 menus..
   1) Press *ENTER* to toggle this feature On/Off
   2) Interval: Press *ENTER* to edit the value, and then type the interval between washes (up to 9999) in hours. Press *ENTER* again to store this value.
   3) Duration: Press *ENTER* to edit the value, and then type the wash duration (up to 99) in seconds. Press *ENTER* again to store this value.
   4) Run: This menu only appears if menu 1 is set to 'On'. Press *ENTER* to test the output, for the duration set in parameter 3.

4: **Photometer** – Set timers associated with the photometer input signals
   1) Damping: Duration a photometer value must remain within a new lighting stages' boundary before the change is activated. Press *ENTER* to edit the value, then type a new value (up to 99 minutes) before pressing *ENTER* again to confirm.
   2) Fault: Number of hours the photometer input is allowed to remain at the same level before registering as being faulty (and sounding the system alarm). Press *ENTER* to edit the value, then type a new value (up to 99 hours) before pressing *ENTER* again to store the new value.

5: **Backup Daytime** - Specify when day/night backup stages are to run in the event of photometer (and photocell, if connected) failure.
   1) Press *ENTER* to toggle this feature On/Off
   2) Dawn: Press *ENTER* to edit the value, and then type the morning backup time (hhmm format), to signify the beginning of 'Daytime'. Press *ENTER* again to store this value.
   3) Dusk: Press *ENTER* to edit the value, and then type the evening backup time (hhmm format), to signify the end of 'Daytime' (i.e. beginning of 'Night time'). Press *ENTER* again to store this value.

5: Unit ID

Sets the unique unit name/reference for the B-CubMaster. Input the name in by selecting an alphanumeric button (1-9, A, B, C, or D) then use the *SCROLL* keys to alter the character. The characters available are:

1-9 " "(space) # $ % & * + , - . = A-Z and a-z

To move on to a next character simply press another alphanumeric button. The ID can be up to 12 of the above characters long, press *ENTER* to store the new ID.

6: Modem

Should you be including a (TSS-supplied) internal GSM modem, it will be automatically configured by the B-CubMaster upon connection. The four configuration strings can be altered here, although it is not advisable to do so without first consulting TSS Engineers.

7: Photometer

Configure the type of photometer connected to the B-CubMaster.

1: Press *ENTER* to cycle through the photometer mA range list, either 0-20, 4-20 or specify "None" if not used.
2: Min value: Press *ENTER* to edit, then type a new value in Cd/m² for the lowest value expected to be read by the photometer, (usually 0000). Press *ENTER* again to confirm the change.
3: Max value: Press *ENTER* to edit, then type a new value in Cd/m² for the highest value expected to be read by the photometer. This is normally the rated value, i.e. 3000 or 5000. Press *ENTER* again to confirm the change.

8: Photocell

Specify if a photocell is connected to the B-CubMaster. The top line displays whether one is present, along with its status if present. Press the "#" key on here to confirm a photocell is connected, the "*" key if otherwise.

9: Backup Stages

In the event of a photometer or photocell fault, the unit has failsafe backup stages it reverts to. Based on the photocell reading, (if present & not faulty) or the Backup Daytime timer ranges, the lights will be set to the stage specified below for day or night. Please take care not to select a stage that has not been configured in the current regime, as the default group pattern for an un-configured stage is all lamps off.

1: **Day Stage**: Press *ENTER* to edit, then type a new stage number for the failsafe day stage. Press *ENTER* again to confirm the change.
2: **Night Stage**: Press *ENTER* to edit, then type a new stage number for the failsafe night stage. Press *ENTER* again to confirm the change.

Menu 5: Reset System

This commissioning tool performs a complete system reset. This includes resetting all of the inputs & outputs of the B-CubMaster, as well as re-fetching all of the stage/photometer levels & configuration information from the internal memory banks.

Upon pressing the "#" to confirm this action, the B-CubMaster also transmits a software reset command out of its RS-485 communications port, targeting all of the B-Cub units connected. This will be repeat-sent continually for 10 seconds to ensure all B-Cubs have heard the command.

After this 10-second period, the B-CubMaster will revert to automatic running mode, in the current lighting regime.

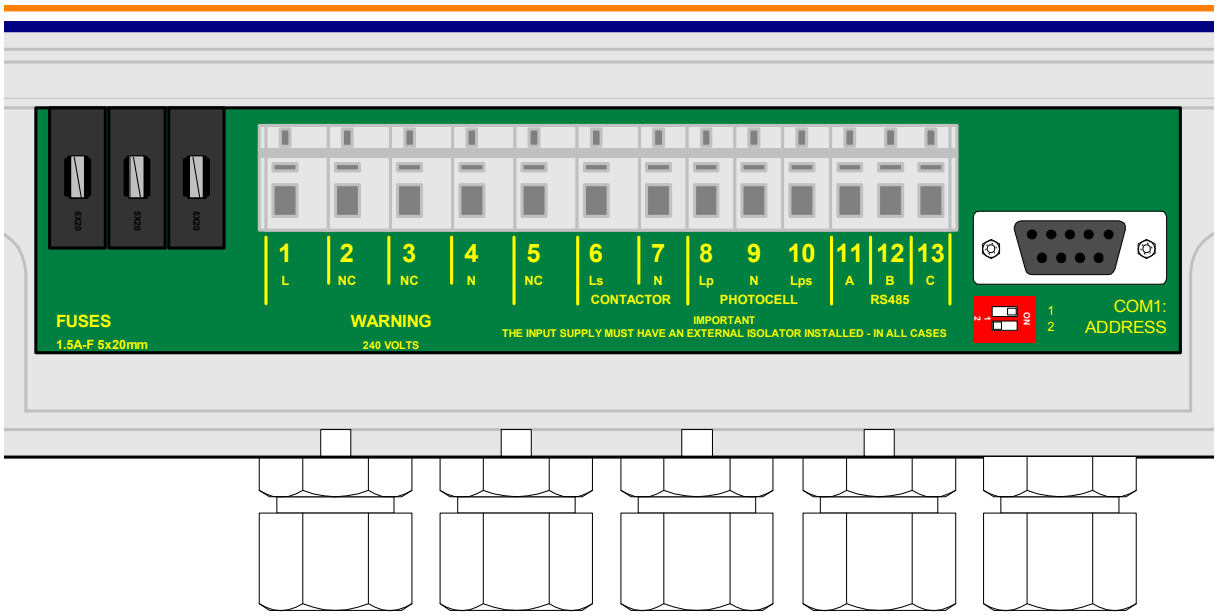
Annex 1: Menu Map

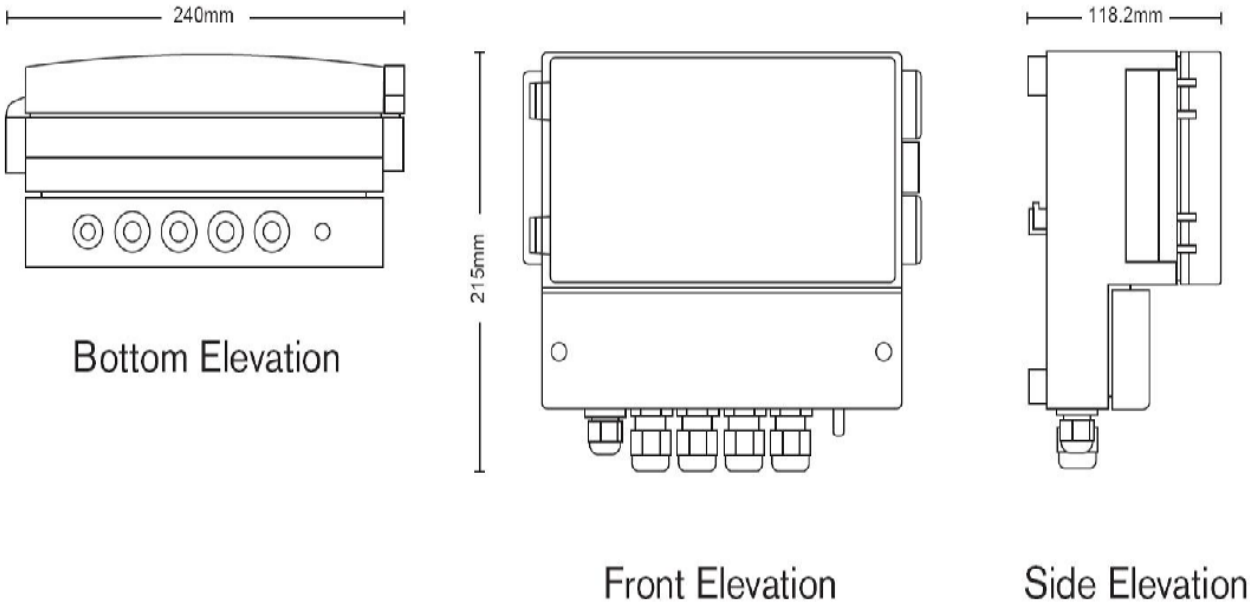
1. History	**1.** System Log	**1**. View Log		
		2. Clear Log	**# Yes, * No**	
	2. Burn Hours	**1**. View Stage	(Stages 1 - 32)	
		2. Zero Stage	**# Yes, * No**	
		3. View Group	(Groups 0 - 31)	
		4. Zero Group	**# Yes, * No**	
2. Switching (Select/Preview)	**1.** Lamp Groups	(Groups 0 - 31)		
	2. Light Stages	(Stages 1 - 32)		
	3. Light Regimes	**1.** Regime 1		
		2. Regime 2		
		3. Regime 3		
		4. Regime 4		
		5. Regime 5		
		6. Regime 6		
		7. Lamps Off		
		8. Lamps On		
3. Alarm (Clear)	**# Yes, * No**			
4. Configuration	**1.** Regimes	**1.** Regime 1	**1.** Label	≤12 characters
		2. Regime 2	**2.** Active	**# Yes, * No**
		3. Regime 3	**3.** Candela Ranges	Stages 1 – 32
		4. Regime 4	**4.** Lamp Groups	Stages 1 – 32
		5. Regime 5		
		6. Regime 6		
		7. Lamps Off	(Active?) **# Yes, * No**	
		8. Lamps On	(Active?) **# Yes, * No**	
	2. Time (Set)	hhmmss		
	3. Date (Set)	ddmmyy		
	4. Timers	**1.** Transition	≤999 seconds	
		2. Load Shedding	≤120 seconds	
		3. Wiper	On&Off / Interval (hrs) / Wash time (secs)	
		4. Photometer	Damping (mins) / Fault (hrs)	
		5. Backup Daytime	On&Off / Dawn / Dusk	
	5. Unit ID	≤12 characters		
	6. Modem	**1.** Query	ATZE0&DO&CO&S1S0=1+CBST=7,0,1	
		2. First Setup	ATQ1V0+IFC=0	
		3. Second Setup	AT+IPR=0	
		4. Third Setup	AT&W	
	7. Photometer	Type / Min Value (Cd/m²) / Max Value (Cd/m²)		
	8. Photocell	In or Out: (**# In, * Out**)		
	9. Backup Stages	**1.** Day Stage		
		2. Night Stage		
5. Reset System	**# Yes, * No**			

Annex 2: B-Cub Lamp Group Switch Settings

Lamp Group	Lamp Group Switches (Up = ON)				
	1	2	3	4	5
0	ON	ON	ON	ON	ON
1	OFF	ON	ON	ON	ON
2	ON	OFF	ON	ON	ON
3	OFF	OFF	ON	ON	ON
4	ON	ON	OFF	ON	ON
5	OFF	ON	OFF	ON	ON
6	ON	OFF	OFF	ON	ON
7	OFF	OFF	OFF	ON	ON
8	ON	ON	ON	OFF	ON
9	OFF	ON	ON	OFF	ON
10	ON	OFF	ON	OFF	ON
11	OFF	OFF	ON	OFF	ON
12	ON	ON	OFF	OFF	ON
13	OFF	ON	OFF	OFF	ON
14	ON	OFF	OFF	OFF	ON
15	OFF	OFF	OFF	OFF	ON
16	ON	ON	ON	ON	OFF
17	OFF	ON	ON	ON	OFF
18	ON	OFF	ON	ON	OFF
19	OFF	OFF	ON	ON	OFF
20	ON	ON	OFF	ON	OFF
21	OFF	ON	OFF	ON	OFF
22	ON	OFF	OFF	ON	OFF
23	OFF	OFF	OFF	ON	OFF
24	ON	ON	ON	OFF	OFF
25	OFF	ON	ON	OFF	OFF
26	ON	OFF	ON	OFF	OFF
27	OFF	OFF	ON	OFF	OFF
28	ON	ON	OFF	OFF	OFF
29	OFF	ON	OFF	OFF	OFF
30	ON	OFF	OFF	OFF	OFF
31	OFF	OFF	OFF	OFF	OFF

Annex 3: B-CubMaster Terminal Diagram & Dimensions





Annex 4: B-Cub Dimensions & Wiring Details