

ICELED

ELECTRO STYLING

ZEN USER GUIDE INSTALLATION GUIDE

WARNING

THIS PRODUCT HAS BEEN DELIBERATELY DESIGNED TO CREATE A HIGHLY NOTICEABLE LIGHTING EFFECT THAT WILL TURN HEADS AT CAR SHOWS AND EXHIBITIONS. BECAUSE OF THIS IT IS EXTREMELY IMPORTANT THAT IT IS **NOT USED ON THE PUBLIC HIGHWAY** TO PREVENT THE DISTRACTION OF OTHER ROAD USERS.

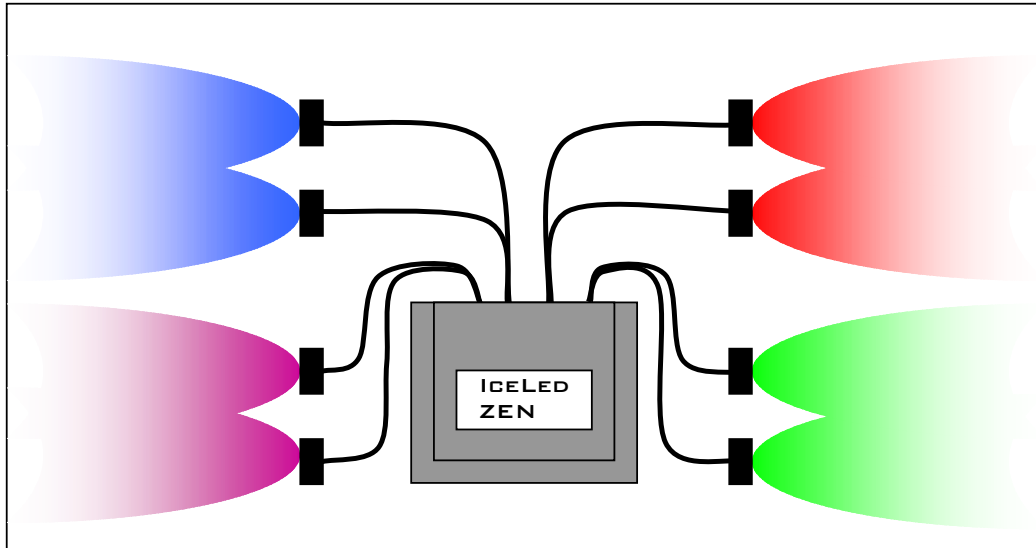
HAVING ISSUED THIS WARNING ICELED LTD. WILL NOT ACCEPT ANY RESPONSIBILITY FOR ISSUES ARISING FROM ANY FAILURE TO COMPLY WITH THIS CLEAR INSTRUCTION.

ICELED LTD. WILL NOT ACCEPT RESPONSIBILITY FOR ANY OTHER ISSUES ARISING FROM IMPROPER USE OR FITTING OF THIS PRODUCT AS THESE MATTERS ARE BEYOND OUR CONTROL.

THIS PRODUCT IS CAPABLE OF PRODUCING STROBOSCOPIC LIGHTING EFFECTS WHEN CONNECTED TO ICELED LIGHT SOURCES.

Features

ICELED ZEN is a 'zoned' lighting controller that can independently connect and command between one and four zones of interior or exterior ICELED emitters. ZEN allows each Zone to be lit with different colours and brightness's according to any one of 10 user-defined programs. Simply selecting the appropriate program can quickly make dramatic changes to the entire lighting arrangement.



The four zones can relate to separate areas - inside a car for example; floor, console, under-dash and roof lights. Some zones may need to be dimmed-out for driving – in which case certain programs can be edited to darken these zones and can be selected whenever required. Not all zones need be used though. ZEN will be equally useful controlling just one or two.

Lighting effects

Each of the 10 programs has access to a number of lighting effects that can be applied to individual zones. For example, there is a variable-speed 'sweep' function, which can be used to cycle through a range of colours. Sound reactivity can also be applied to animate the colour or other qualities of the light produced in time with a music beat. A further option allows zones to be synchronised to the ICELED UFO controller when present. A separate 'lightning' program causes all zones to strobe in random sequences.

Automatic operation

Each ZEN has an Enable input that can be connected to an external circuit (e.g. door switch or sidelights) allowing a preset lighting scheme to be switched-on automatically whenever the external circuit is active. This is always program 0. The most obvious application is for switching-on interior lighting when doors are opened, however, ZEN may also be useful for controlling external lighting where the colour of each zone can be preset to conform to a particular lighting requirement e.g. white to the front, red to the rear etc. At other times different programs can be selected to override those colours with something more interesting for shows or other off-road meetings.

Colour terminology

ZEN makes extensive use of the **hsb** colour model to provide easy access to a wide range of attractive colours and effects. This model specifies colour using three components familiar to painters and artists: **hue**, **saturation** and **brightness**.

Whenever 'colour' is mentioned in this guide, it should always be thought of as being a particular combination of various levels of *hue*, *saturation* and *brightness* resulting in one of the two million colours that ICELED light sources can produce – including pastel shades, white and even black. The following diagrams should make the role of each component easy to recognise:

Hue: increasing the level of *hue* shifts the colour along the visible spectrum e.g. from magenta to blue.



Saturation: for any given *hue* (e.g. blue in the example below) increasing levels of *saturation* produce purer hues – or more vivid colours.



Brightness: for any given combination of *hue* & *saturation* (e.g. pale blue in the example below) increasing levels of *brightness* simply boost the overall amount of light produced.



In all the above examples, the full control range is arbitrarily depicted as spanning from 0% to 100%. This represents the lower and upper limits of the remote control range which, when reached during editing, causes the zones to emit warning flashes.

NOTE: *Brightness* should normally be kept at maximum except for when deliberately dimming-down certain zones or making them completely dark.

NOTE: Low levels of *saturation* will always result in brighter, whiter, colours. However, some effects like the sweep function will be unable to influence colours with very low levels of *saturation*. To adjust the hue of such colours, first increase the saturation so the hue can be seen.

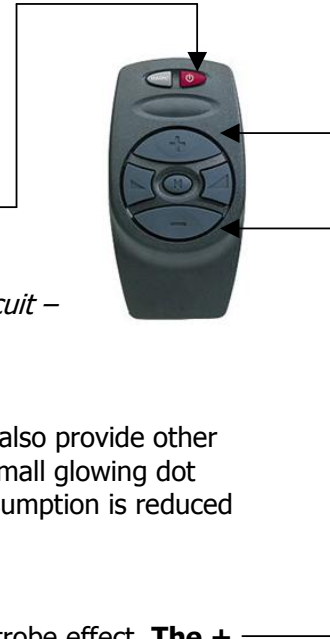
Basic operation

Just three buttons are all that are needed for basic operation:

To switch on or off any time press the red power key.

The last program selected will always be recalled at switch-on.

Another press will immediately turn off all zones. *Switching-off in program zero also inhibits automatic operation by an external circuit – until such time as the power key is used again.*



Remote display

The remote display normally shows the program number but will also provide other useful information when appropriate. A blank display except for small glowing dot indicates that the control unit is in standby mode and power consumption is reduced to a minimum.

Selecting programs

There are preset 10 programs to choose from plus a 'Lightning' strobe effect. **The + and – keys step up and down through each program.** If the programs are stepped through slowly, one at a time, then a smooth transition will be made between the previous colours and the new set. Once the highest or lowest program has been reached, the keys will not step any further in that direction.

Each of the 10 programs can recall an independent arrangement of colours for all four zones. In addition to these *home colour* definitions, other options are recalled determining the way that zones are animated. As a result of this each zone may be independently instructed to either respond freely to both colour sweeps and sound or to show UFO colour data if connected. Alternatively zones may be muted so that they're only affected by sweeping and not sound – or locked completely forcing them to always show their fixed, *home colours*.

A set of 'Factory defaults' are provided to enable the controller to be demonstrated immediately following installation. Any program can be edited to suit individual requirements thereafter. The following table summarises all the preset variations provided and the remote keys used to select them:

NORMAL KEYS		MAGIC KEYS		HOME COLOURS & OPTIONS			
+ - PROGRAM	< > SWEEP	+ - COLOUR RANGE	< > AUDIO EFFECT	ZONE 1	ZONE 2	ZONE 3	ZONE 4
P L	FAST	C R	J	FREE	FREE	FREE	FREE
P 9	FAST	C R	[	UFO	UFO	UFO	UFO
P 8	FAST	C R	=	FREE	UFO	UFO	UFO
P 7	MEDIUM	C U	] ]	MUTE	MUTE	UFO	UFO
P 6	MEDIUM	C 7	[	FREE	FREE	FREE	UFO
P 5	MEDIUM	C 5	[	MUTE	MUTE	FREE	FREE
P 4	SLOW	C 3	] ]	FREE	FREE	FREE	FREE
P 3	SLOW	C 2	] ]	FREE	FREE	FREE	FREE
P 2	SLOW	C 1	[	FREE	FREE	FREE	FREE
P 1	MANUAL	C 0	[	FREE	FREE	FREE	FREE
P 0	MANUAL	C 0	=	LOCK	LOCK	LOCK	LOCK

Table contents are describe in later sections.

Program zero

This program is special as it can also be selected automatically e.g. when a door is opened. However, this only happens if the unit is already switched off. For example, opening a door will not override any other program already in use. Switching off the unit with the power key on the remote control *when program zero is selected* can temporarily disable this feature if required. Normal operation is restored after the unit is switched back on again with the power key.

In the case of being switched-on automatically by opening a door, program zero will remain on even after the door is closed to provide light for long enough to prepare for driving. This extended delay before fadeout will automatically be terminated on starting the engine.

Program zero can also be selected directly from any other program position by pressing and holding down the – key for a few seconds. This can be done to return the controller to automatic mode before leaving your vehicle. Doing this, rather than switching off before exiting, will provide continuous ambient illumination. Once selected, program zero will remain on until the enable input instructs it to switch off. This will be the case once the door has finally been closed.

Strobing

To activate the 'Lightning' strobe effect, press and hold down the + button for a few seconds until strobing starts. Use the – button to return to the normal programs. The strobe responds to sound activation and to the speed control. When engaged the remote display will show: **P L** ('Lightning' strobes)

Audio activation

Unless individually muted, colour changes in Zones can also be sound activated by pressing the Audio button in the middle of the keypad. This toggles sound activation on and off with each alternate press. Audio activation can be used together with the sweep speed to create even more interesting effects.



The small dot on the remote display lights brightly when sound activation is enabled and will blink on each beat detected.

Program settings

Every program recalls and responds to three separate settings that are **globally** applied to all eligible zones:

Sweeping the hue of zones

Unless Zones are programmed as 'locked' - the hue of their *home colours* can be made to change over time. The two ramp keys on either side of the remote handset control the rate of change. *All zones will flash to warn when the high and low speed limits have been reached.* At the slowest setting sweeping is temporarily halted on the colours shown. Individual speed settings are remembered for each program.



All zones being swept will *hue-shift* relative to their *home colours*. This means that if all zones were preset to the same *home colour* they would all track together showing

the same sweeping colour. If different *home colours* were preset in each zone then their offsets in *hue* will be maintained so that different colours would continue to be shown in each zone. It is also possible to select the range of hues covered by the sweep including a manual mode which links the colours directly to the ramp keys.

ZEN MAGIC



The four main buttons in the central ring can be shifted to perform two more global adjustments by **briefly** pressing the key marked MAGIC. The buttons will remain like this for as long as they are used. They will automatically return to their normal functions after around five seconds of inactivity.



Choosing different colour ranges

Each program can be set to sweep the zones through smaller or larger colour ranges. A selection can be made from a series of nine restricted ranges (*hues* adjacent to the *home colour* for each zone), from the whole spectrum or selected entirely at random. The selected range acts globally on all four zones.

To select a new colour range for the current program, **briefly** press the button marked MAGIC, then press the + or – buttons to step up and down through the 12 available ranges:

C r	Random colours	
C u	Unlimited colours	
C 9	9 colours	
C ...	...	...
C 3	3 colours	
C 2	2 colours	
C 1	1 colours	
C 0	Manual selection	

The range selected here will determine how far the sweep is allowed to shift the *hue* through the spectrum – in the case of ranges 1 to 9 starting from and returning to the *home colour* preset in each zone. Manual control of hue is obtained using the ramp keys that otherwise set the sweep speed.

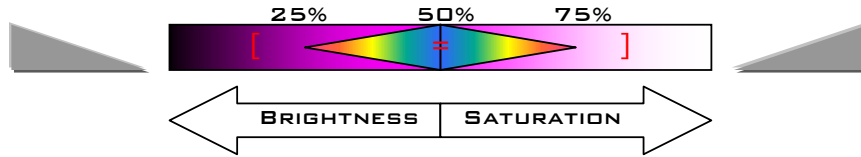
When the required range is seen, after a few seconds without any button presses the handset keys will return to their normal 'Program' and 'Speed' functions.

Changing the audio effect

If zones are free to respond to sound then the way they do so is determined by the setting of the ramp keys after MAGIC has been pressed. *As with the normal speed selection function of these buttons, this setting has two extremes that produce warning flashes when reached.*



At the minimum setting the audio beat will cause the *brightness* of each zone to pulse to the *home colour* setting then fade to darkness until such time as the next beat arrives. Increasing the setting will gradually raise the minimum *brightness* up to a point halfway through the control range at which no dimming will occur at all. In the diagram that follows this region of control is labelled **Brightness**:



From the 50% point onwards each beat will reduce the *saturation* of the colour towards white instead. This control region is labelled **Saturation**. Again the effect becomes more pronounced the further towards the limit the setting is taken. At the extreme, each beat completely *de-saturates* the colour forcing it to white.

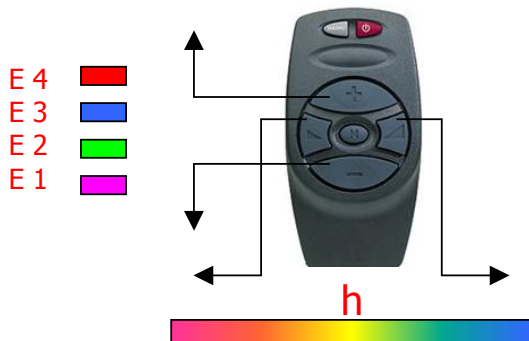
Note that the remote display indicates which region the setting is in during adjustment by flashing [while in the *brightness* range, = when at 50% and] while in the *saturation* range. All zones will flash when the limits are reached.

In addition to these two distinct effects, around the centre of the range, every beat will also step the *hue* of each zone by a variable amount. The size of this hue-step varies symmetrically either side of the centre of the range – with the 50% position providing the biggest step. This position also coincides with the minimum change in *brightness* or *saturation*. The step in *hue* falls off to zero below the 25% and above the 75% points. This just leaves *brightness* or *saturation* affected by the audio beat.

Using this arrangement makes a wide variety of different effects accessible from a single control. Naturally, different programs can be configured with different effects to suit any particular application.

Editing individual Zones

Every program recalls its own set of *home colours* for each zone. To change the zone colours for a particular program, first select the required program, then **press and hold down the power key for several seconds**. First all the zones will switch off – but keep the button held down until they light up again. This puts the controller into **Editing mode** and all four zones will show their *home colour* settings.



In this mode the + and – buttons step up and down through each of the four zones. The display shows E 1 to E 4 and any light sources connected to the selected zone briefly blink in white to identify themselves as ready for editing.

Once the required zone is selected it can be edited in various ways:

Hue

To change the *hue* of the selected zone press either of the ramp keys. These will slowly cycle the *hue* through all the colours of the rainbow.

During adjustment the remote display will flash **h** to indicate that *hue* is changing.

Note that it may not be possible to see the effects of any changes in *hue* if *brightness* or *saturation* are too low i.e. the colour is too dim or too close to white. Increase these levels first as outlined below.

Obtaining different shades

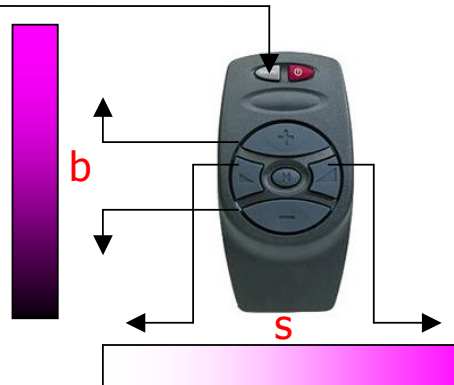
Shifting *hue* using the ramp buttons only changes the tint of the colour on display. Two further parameters - *brightness* and *saturation* are required to fully define the quality of the light produced.

Brightness

Having selected the required zone using the + and - keys, to change the *brightness* of the zone briefly press the **MAGIC** button and then use the + and - keys to increase or decrease the level.

All light sources on the selected zone will immediately react to the changes by showing brighter or dimmer colours.

The remote display will flash **b** while adjusting *brightness*. Once the limits of *brightness* have been reached, all zones flash to indicate that no further adjustment is possible.



Whatever the level of *saturation* or *hue*, the overall intensity of the light produced will be governed by *brightness*. For example, some zones might require 'dimming down' for certain situations – or might even be required to be completely dark – effectively turning them off altogether.

Saturation

To adjust the *saturation* of the colour briefly press **MAGIC** followed by the ramp keys. Higher levels of *saturation* result in purer or more vivid colours. Lower levels of *saturation* result in paler colours with white being the extreme case.

The remote display will flash **S** while adjusting *saturation*.

Zone options

In addition to their *hsb* colour definition each zone has four options that determine how the zone reacts to colour changing influences. In Zone editing mode the audio key in the middle of the handset cycles continuously through each of the four options with each repeated press.



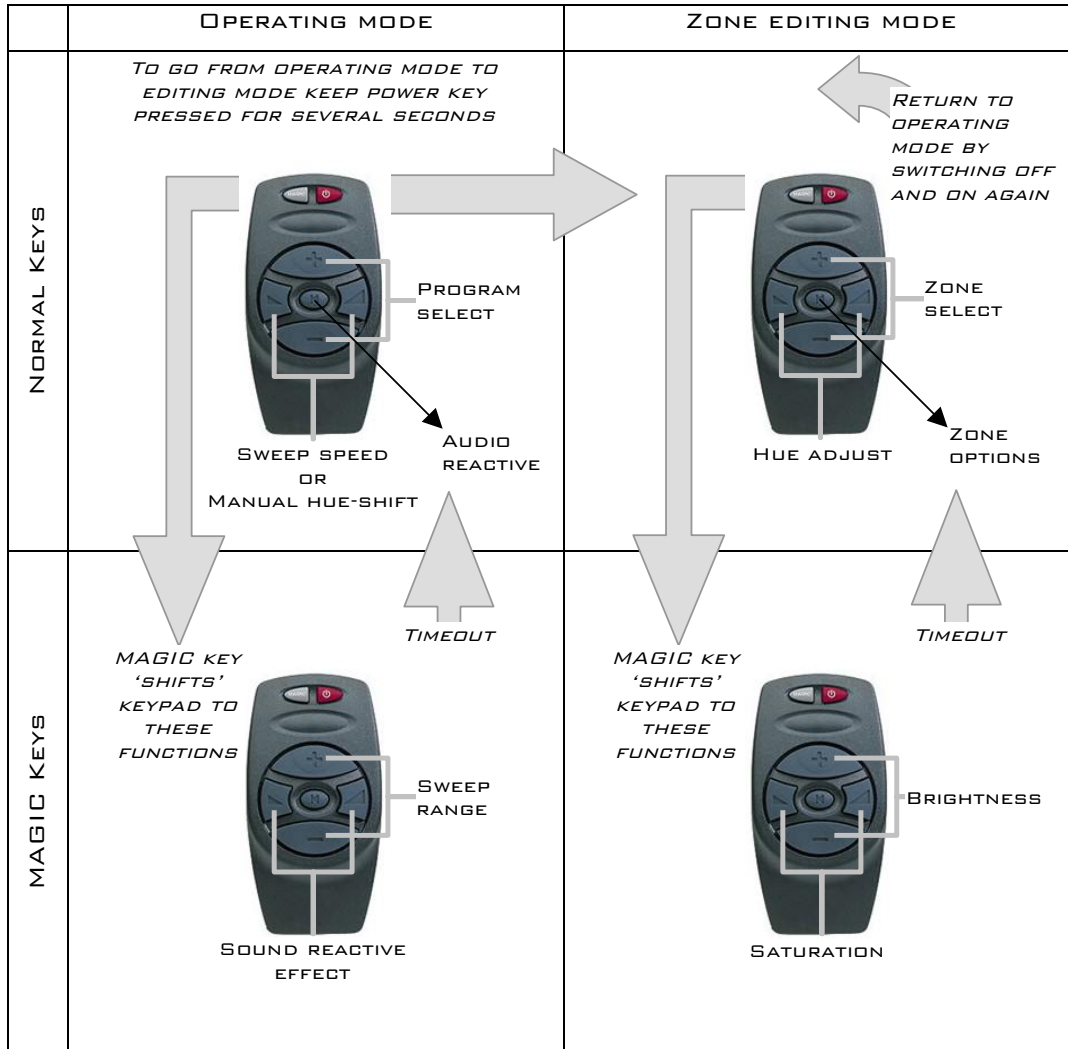
A series of blinks from the zone being edited keeps track of the option selected. To select any of the four options shown in the table below, repeatedly press the audio key until the corresponding number of blinks is seen.

BLINKS		
1	FREE	ZONE IS FREE TO SWEEP AND REACT TO SOUND
2	UFO	AS ABOVE BUT WILL BE OVERRIDDEN BY UFO IF PRESENT
3	MUTE	ZONE IS SWEEPED ONLY
4	LOCK	ZONE REMAINS FIXED ON HOME COLOURS

Exiting Zone editing mode

To exit zone editing mode press the power button to switch off then once again to switch back on. The current program will be restored and the zones will resume with their new settings.

Programming chart



Demo mode

ZEN can be made to periodically select programs (including the strobe) at random by pressing and holding down the Audio key in the middle of the handset for a few seconds. The current program will change to a random one as soon as demo mode is engaged. Pressing any key will cancel demo mode.

Installation

The complete kit consists of:

- | | |
|----------------------------|---|
| 1 x ECU | 1 x Fused supply wire |
| 1 x Remote display | 1 x Chassis return wire |
| 1 x Remote control handset | 3 x Self-tapping screws for mounting ECU |
| | 1 x Self-tapping screw and washer for chassis return wire |

Installation should be carried out in the following sequence after first reading through every step (this will assist in locating everything in the best position).

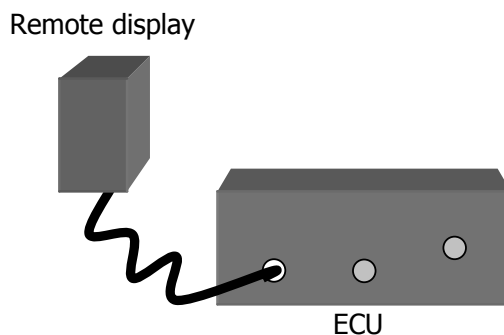
Step 1: Install the ECU

The ECU must not be exposed to moisture or excessive heat so should therefore be located inside the car or luggage bay – not outside or within the engine bay. The ideal location would be somewhere under the dashboard, with a short route to the car battery. The box should be secured to a flat surface using the three short self-tapping screws provided. Ensure that the drilling of these holes will not damage wiring or other equipment on the other side. Care should also be taken not to over-tighten these fixings.

A fourth hole will be required nearby to attach the chassis return wire. It is not sufficient to use any of the case screws for this connection, as it needs to be fully tightened in order to make a good connection to the metalwork. Do not connect either of the power wires yet.

Step 2: Locate the remote display

The remote display unit plugs into a socket on the rear of the ECU.



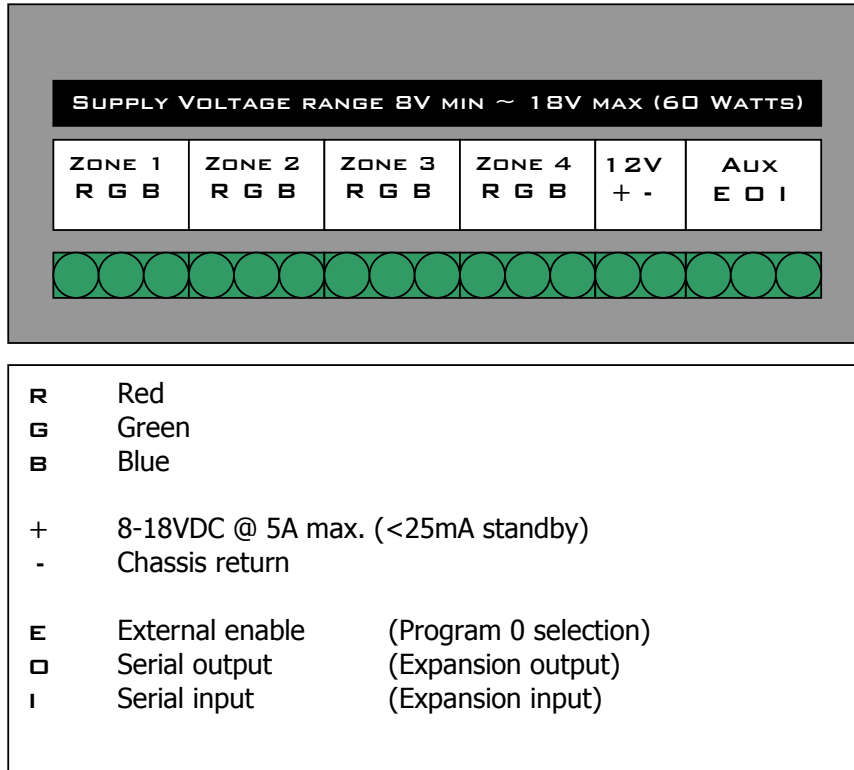
The display should be positioned where the driver can see it and, as it also receives infrared commands from the remote handset, it should be located at window level to allow the handset to be operated from outside the vehicle.

An ideal place for the remote display might be in the corner of the dashboard where it meets the windscreen.

If ICELED UFO is also installed, the two remote displays must be separated as they can be operated by the same remote handset. The handset can then simply be pointed toward the system to be adjusted.

Step 4: Wiring the ECU

The 3-way connectors that terminate the red green and blue wires from each of the four zones can be assembled and plugged in at this stage. If they are inserted in the wrong positions they can easily be swapped around later on.



Connections to the 12V supply should be made with the fuse temporarily removed from its holder in the red lead:

The red + wire should be run directly to the vehicle battery if possible, in order to maintain a permanent supply for standby mode. Other power 'pick-up' points may be suitable so long as they provide a constant supply. In either case the fuse holder must be located nearest the supply end so that the fuse can be effective in protecting the wire all the way back to the ECU. To maintain protection, if this wire is to be shortened at all, it must be cut off at the end furthest from the fuse.

The ring terminal on the end of the short black wire needs to be firmly attached to the vehicles metalwork using the self-tapping screw and serrated washer supplied. **A good contact is essential here.**

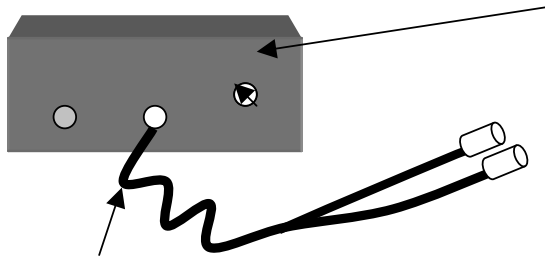
If an external enable is to be used it should be connected now. A switch connecting this input to chassis when the door is open or a connection to the sidelight circuit are typical examples of external enables. Any small-gauge wire will be suitable for this connection.

Step 5: Powering-up and testing

Once the fuse and 12V plug are inserted the remote display should light up showing a version number. After a few seconds the display should clear down to just a standby dot showing that the controller is ready. Press the power button on the remote handset to switch on the zones. If the external enable was active during power-up it will automatically switch to program 0 instead of entering standby mode.

Adjusting the audio level

The ECU will automatically adapt to different sound levels over a wide range so no adjustment should be necessary. However a variable attenuator is provided at the rear of the unit if the sound levels are unusually high. This might be required if the patterns do not respond well to the music.



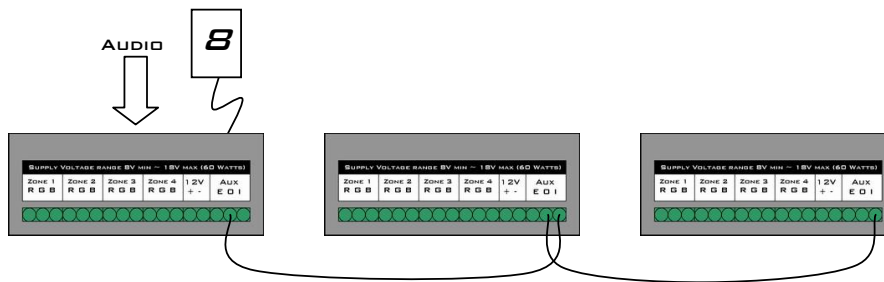
The attenuator is adjusted with a small flat bladed screwdriver through a hole in the case. Turn the dial clockwise to reduce sensitivity.

A direct line-level connection can be made to In Car Entertainment

systems using the optional link cable. This automatically disables the internal microphone so ensuring that music alone activates the light show – to the exclusion of all external sounds. The attenuator is still effective when a direct connection is used.

Expanding the number of zones

Multiple ZENs can be linked together to act like one single controller with extra zones. All that is required is to run a wire from the 'O' terminal of one ZEN to the 'I' terminal of the next. The first controller is the only one that should have a remote display plugged in. Additional controllers take their commands across the expansion link. This is also true of the audio input if connected – only the first device in the chain needs to be wired.

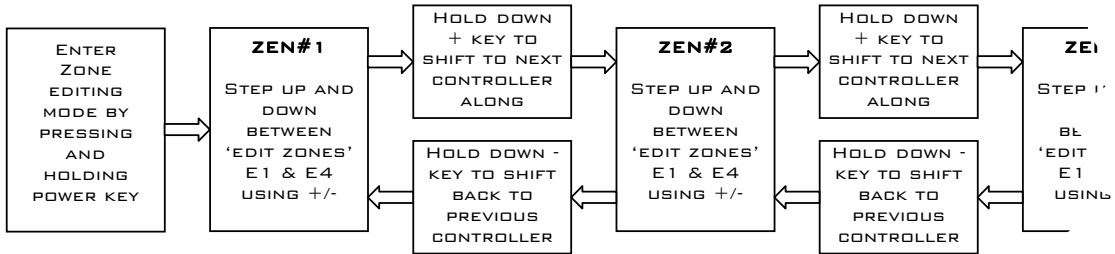


Each additional controller requires its own connection to the 12VDC supply.

Editing expansion zones

In normal operating mode linked controllers all respond to the same program and speed changes. However in order to edit the *home colours* and *options* in zones belonging to expansion controllers it is necessary to step from controller to controller while in zone editing mode.

To step from controller to controller press and hold down the + key to shift to the 'next controller up' while selecting zones. When the shift has been made, the first zone of the expansion controller selected will blink to identify the new range of zones that can be selected. Likewise, shifting back can be accomplished by holding down the - key instead. The following diagram shows how control is passed from controller to controller:



Expansion zone enable

Each additional ZEN may have its enable input E wired to a separate circuit to automatically switch to program 0 on external command. In this case only the four zones associated with that particular controller will be activated. Groups of zones can be 'ganged together' simply by wiring the same enable signal to each controller.

Enable polarity

The default is for ZEN to switch to program 0 when the enable input is grounded. It is possible to re-program this so that connecting 12Volts to the enable turns it on instead. This might be required if ZEN is to operate automatically from the sidelight circuit for example. To change polarity, the remote display must be plugged in and either + or - on the remote handset should be pressed soon after connecting power to ZEN. The remote display first shows a version number followed by a dot, then either 0 or 1 indicating active low (ground) or active high (12V).

e.g. **V1.0** version 1, active low. This can be changed within three seconds by pressing + on the remote control handset to change to active high or - for active low. The display will flash back the new setting.

Linking with UFO

ZEN's expansion input (I) can also be wired to the Interior data terminal (I) on UFO. Doing so allows zones to show the global ICELED colour generated from the underbody pattern. In this case any external audio input **MUST ONLY** be connected to UFO. The signal is then passed to ZEN via the link. ZEN still requires its own remote display but may continue to be expanded as described above.

