COOLEDGE™

| 90W | 90W | 90W | 90W |

SELV POWER SUPPLY (PSU)

24V/58V

CONTROL MODULE

AC

CASAMBI

DALI
DMX
0/1 - 10V

⚠ Suitable for use in dry locations only - IP20

⚠ CONTROL MODULE should be installed by a qualified electrician.

⚡ All devices should always be disconneced from mains power supply and verify its absence prior to installation/maintenance.

⚠ Damage to CONTROL MODULE and/or light sheets may occur if wired incorrectly.

FCC STATEMENT:
This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

CE

c (UL) us
LISTED

RoHS

5
5 YEAR SYSTEM WARRANTY

5 Year Limited Warranty:
Parts and workmanship

CONTENTS

1.0 IMPORTANT INSTALLATION NOTES

Please read instructions prior to installation

Installation must be completed by a qualified electrician in accordance with all national and local electrical and construction codes.

Ensure power is off prior to installation.

Cooledge Control Modules are IP20 rated. For a higher degree of ingress protection, they must be mounted ina suitably rated enclosures.

Cooledge Control Modules must be powered by a Cooledge approved constant voltage SELV Power Supply.

Using a non-approved power source could damage the system and will void the warranty.

2.0 COOLEDGE CONTROL MODULE MODEL NUMBER LEGEND

C T R - ☐☐☐ - ☐☐☐ - ☐☐ V

Mode	
SCT	Static Color Temperature
TNW	Tunable White
DTW	Dim-To-Warm

Control Protocol	
DAL*	DALI Control
CAS	Wireless (Cassambi)
DMX	DMX Control

* Includes 0/1-10V

Input Voltage	
24	24 Volts
58	58 Volts

List of Product Part Numbers:

C T R - S C T - D A L - 2 4 V
C T R - S C T - C A S - 2 4 V
C T R - S C T - D M X - 2 4 V
C T R - S C T - D A L - 5 8 V
C T R - S C T - C A S - 5 8 V
C T R - S C T - D M X - 5 8 V
C T R - T N W - D A L - 5 8 V
C T R - T N W - C A S - 5 8 V
C T R - T N W - D M X - 5 8 V
C T R - D T W - D A L - 5 8 V
C T R - D T W - C A S - 5 8 V
C T R - D T W - D M X - 5 8 V

3.0 INTRODUCTION TO COOLEDGE CONTROL MODULE

The Cooledge Control Module receives a single DC power input from a constant voltage Power Supply (24V or 58V) and converts it into up to 4 controlled output channels of max. 90W each. Input signals from 3rd party controllers are used to control dimming and CCT tuning (if applicable). The control protocol required to interface with the controller determines which Control Module product model is required: DALI (0/1-10V), DMX, or Wireless (Casambi).

Controls Input Cover

DIP Switch Cover

Output Channel and Power Input Cover

Mode and Addressing DIP Switch

Output Channels

Status LED

Power Input

| CH 1+ |
| CH 1- |
| CH 2+ |
| CH 2- |
| CH 3+ |
| CH 3- |
| CH 4+ |
| CH 4- |

+VIN
GND

0-10V INPUT

DALI

0/1 - 10V Inputs

DALI / DMX Inputs

Wireless Card
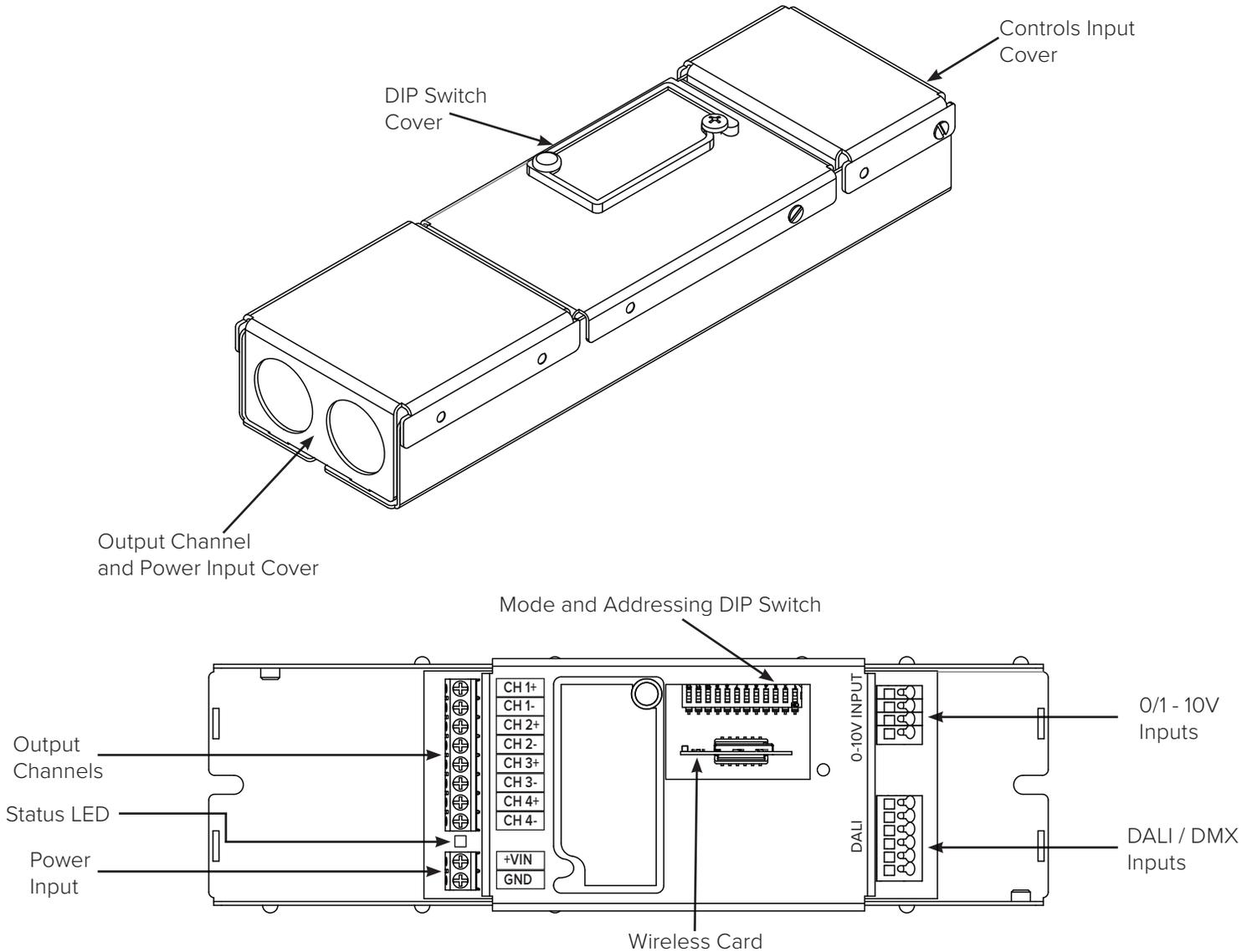
To access the DIP switches for selecting the operational mode, remove controls input cover.
Positions 1-3 are used to identify the controller mode. Settings for each mode are explained in each section.

⚠ Note: The Control Module accepts wire gauges in the range of 14-16AWG **ONLY**. Remote electrical connection can still be achieved with 10-12AWG wire if it is spliced onto a section of 14AWG connected directly to the Control Module.

⚠ Note: When making electrical connections to the Control Module, **DO NOT** overtorque the set screws in the terminal blocks. Tighten the screws until they offer moderate resistance, using **ONLY** hand tools.

4.0 CARE AND HANDLING GUIDELINES

As with all electronics, Cooledge Control Modules are susceptible to damage from Electrostatic Discharge (ESD). Where possible avoid situations that are conducive to creating static.

Avoid dropping the Control Modules.

5.0 MOUNTING

Fasten module in position by using the two mounting slots. (Fasteners not supplied)
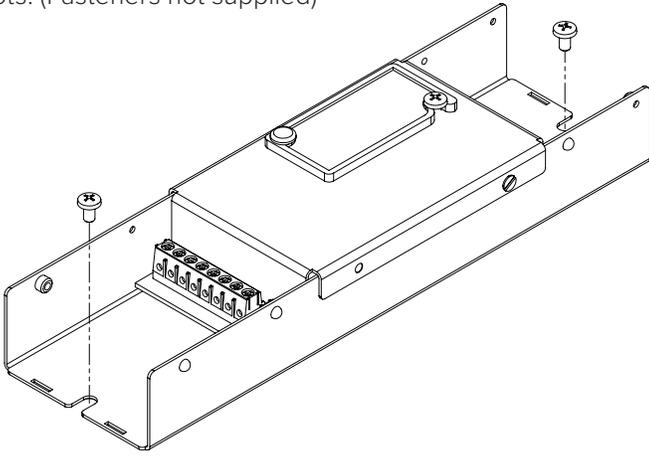
Terminal covers support 1/2" (13mm) strain relief or conduit.
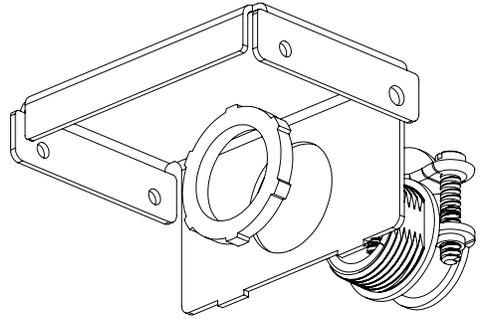
Guide cables through conduit/strain reliefs and covers; then make connections as required.
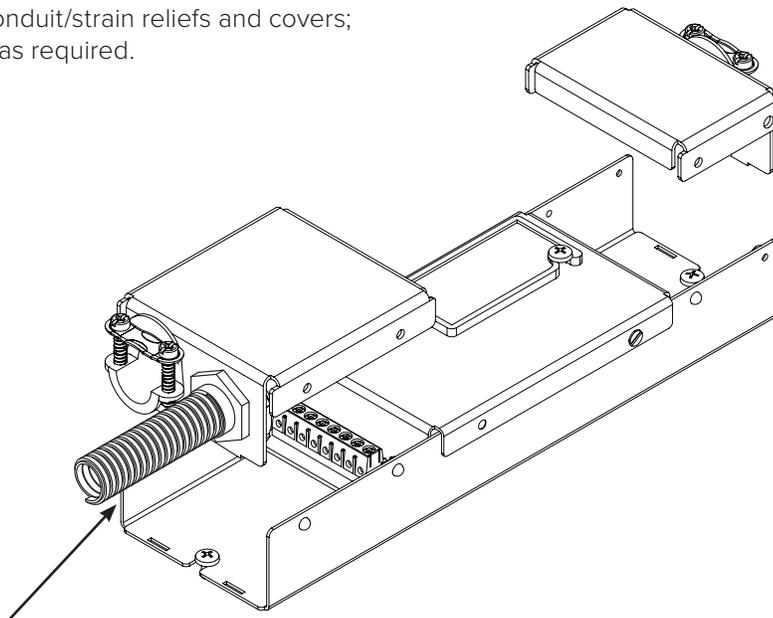
To meet UL requirements conduit or armoured cable must be used for power input cables.
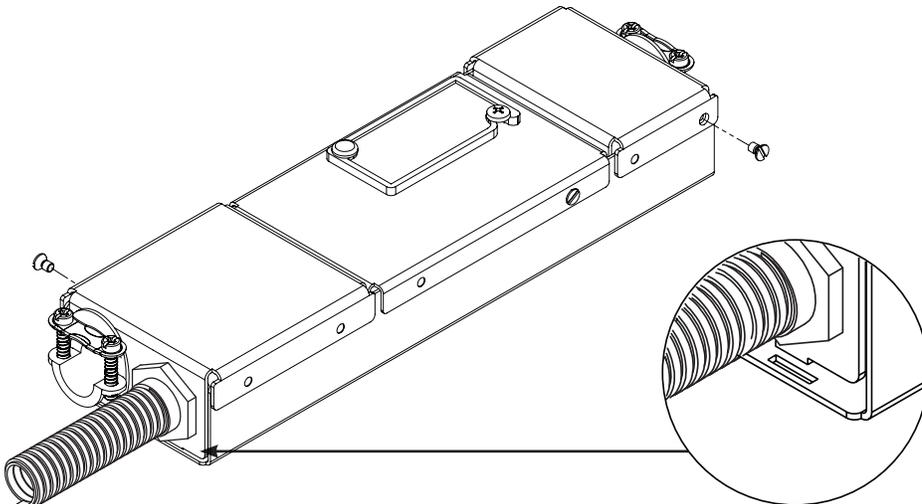
Snap terminal cover onto module ensuring tabs locate into base. Then secure using screws provided.

6.0 INPUT POWER

58V - 100/200/400W - SELV
24V - 100W - SELV

24V - 400W - SELV
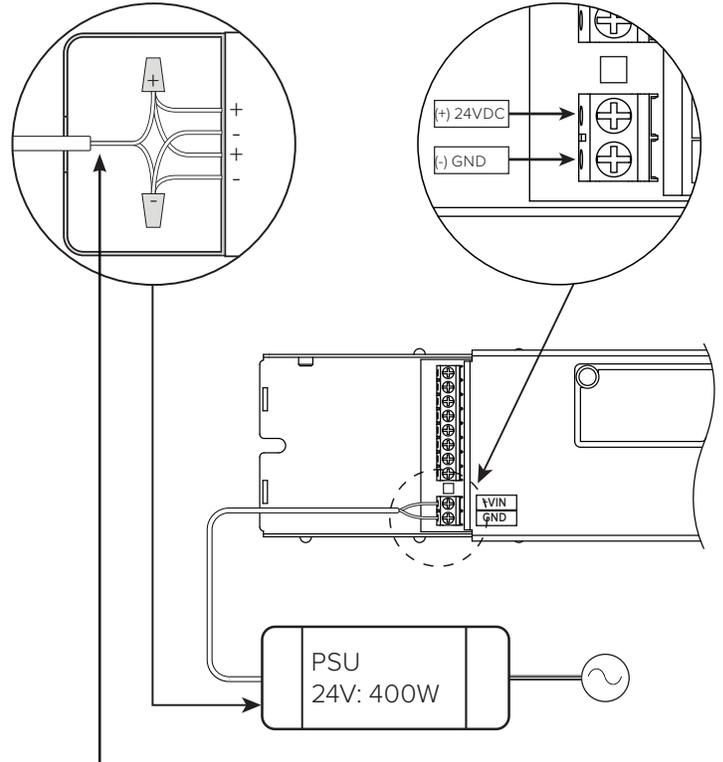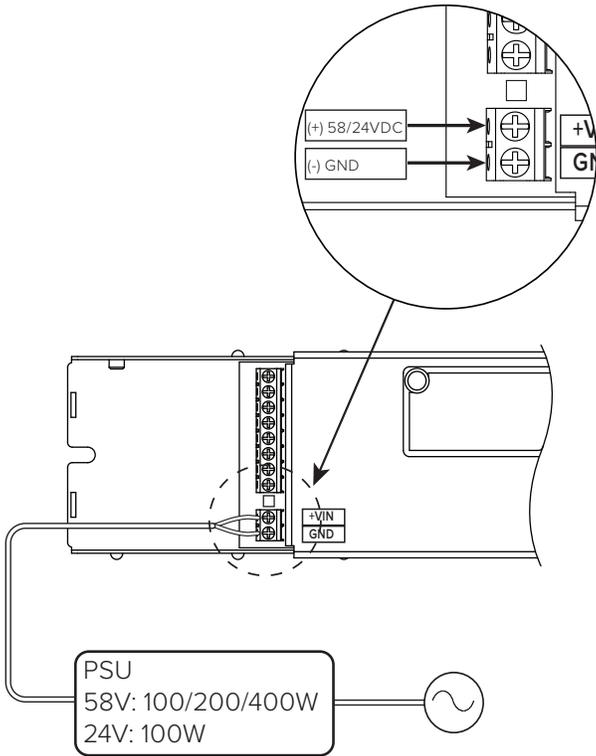
The 100W PSU (58V) cUL version is not compatible with Cooledge Control Modules.

Wire size: 14-16AWG (1.3mm^2 - 2.1mm^2)

Optional wiring method for TNW and DTW installations using the 400W 58V PSU.
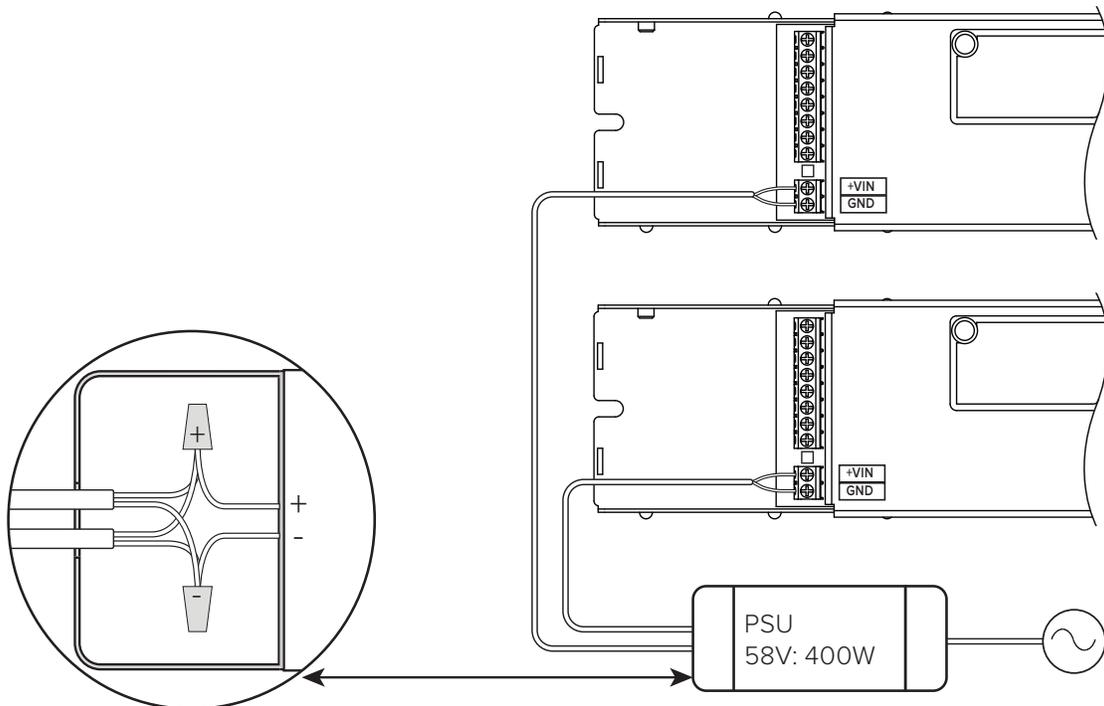
7.0 OPERATIONAL MODES

The Cooledge Control Module has three (3) standard operational modes that are preset at the factory and ordered by product model type:
1) Static Color Temperature ("SCT"): used with TILE Interior, TILE Exterior, and LINE to control dimming, where a single CCT is available.
2) Tunable White ("TNW"): used with TILE Tunable White to control dimming and CCT tuning.
3) Dim-to-Warm ("DTW"): used with TILE Tunable White > Dim-to-Warm option to control dimming which then sets the CCT.

In addition to the preset operational modes, there are two additional modes that may be enabled by changing DIP switch settings on the module:
- Standalone: may be used to access preset dim levels or CCTs where there is no 3rd party controller
- Dynamic Test: may be used for on-site troubleshooting to diagnose system problems without the use of a 3rd party controller. The operational mode is set using DIP switches 1-3 as indicated in Sections 7.2 - 7.7. In general, there should not be a need to adjust the switches unless accessing one of the two additional operational modes.

- Switches 1 - 3: Control Module MODE
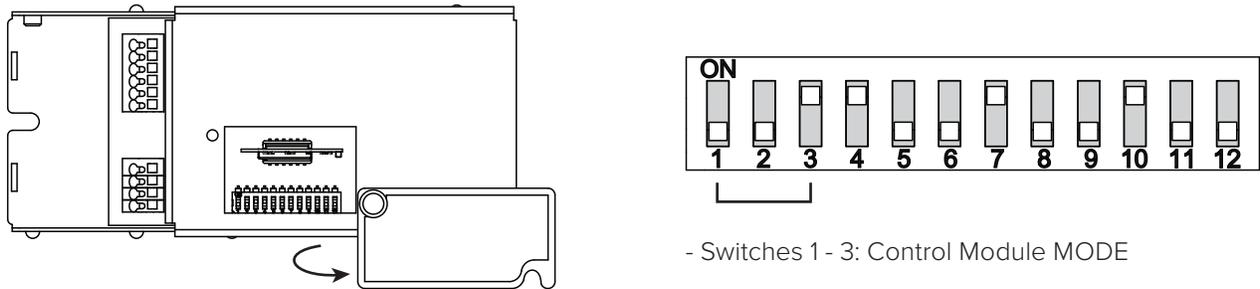
- To access the DIP switches for selecting the operational mode, unfasten the cover screw and rotate cover out of the way.
- Each switch from 1-3 is used to identify the controller mode, see charts below. For example to set the controller to Tunable white (TNW) mode, set switch 2 in the ON (=1) position and the rest in the OFF (=0) positions, 0-1-0.

7.1 CONTROL PRIORITY

Each module has the capability of being controlled via external control signals or on-board settings. The control priority is as follows:

DALI (0/1 - 10V): If the Control Module receives a DALI input, it will operate according to the DALI commands it receives in priority to 0/1 - 10V signals that may be received. Eg. if both protocols are connected, the module will execute DALI commands. If one of the additional operational modes (Standalone or Dynamic Test) is selected, the module will ignore external controller commands and operate according to the settings of the operational mode selected.

DMX: If one of the additional operational modes (Standalone or Dynamic Test) is selected, the module will ignore external controller commands and operate according to the settings of the operational mode selected.

Wireless (Casambi): When the wireless chip is installed in the Control Module all other inputs are ignored. If one of the additional operational modes (Standalone or Dynamic Test) is selected, the module will ignore Casambi enabled device commands and operate according to the settings of the operational mode selected.

7.2 STATIC COLOR TEMPERATURE (SCT)

Static color temperature is a mode in the Control Module used for controlling the dimming features of Cooledge products: TILE Interior, TILE Exterior, and LINE. There are 4 output channels, each channel is able to handle up to a 90W load.

Dimming Protocol	Mode Switches 1-3 (Log)*	Mode Switches 1-3 (Linear)
0/1 - 10V SCT	0-0-0	0-0-1
DALI SCT	0-0-0	0-0-1
DMX SCT	0-0-0	0-0-1
Wireless SCT	0-0-0	0-0-1

*Factory set. If the Linear dimming curve is required, the DIP switch settings must be adjusted as shown. See Section 7.6 for details of the two dimming curves.

INPUTS
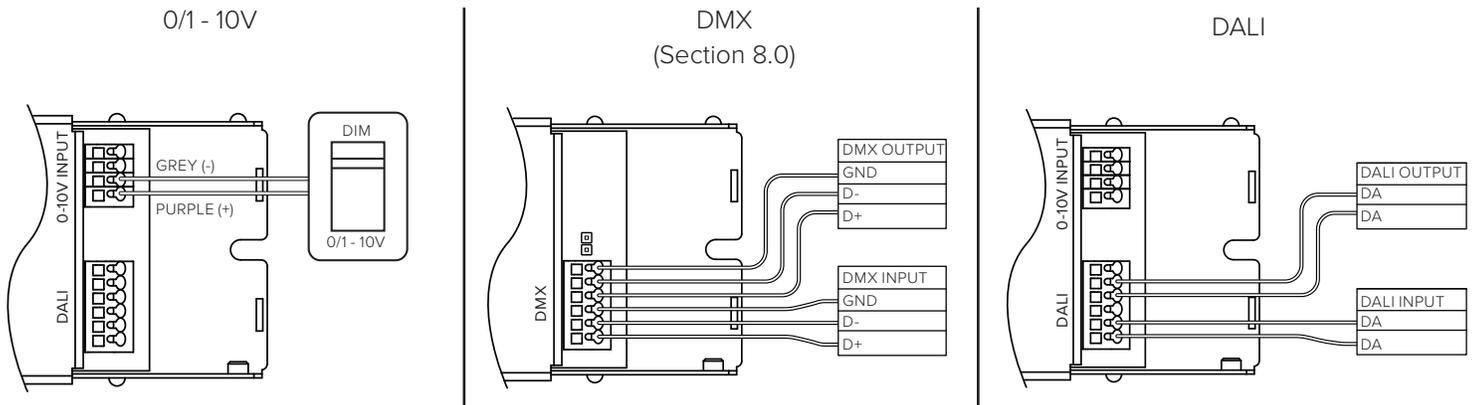
Note:
A single 0-10V input dimming command will be applied to all output channels.

OUTPUTS   Refer to section 7.5 for wireless
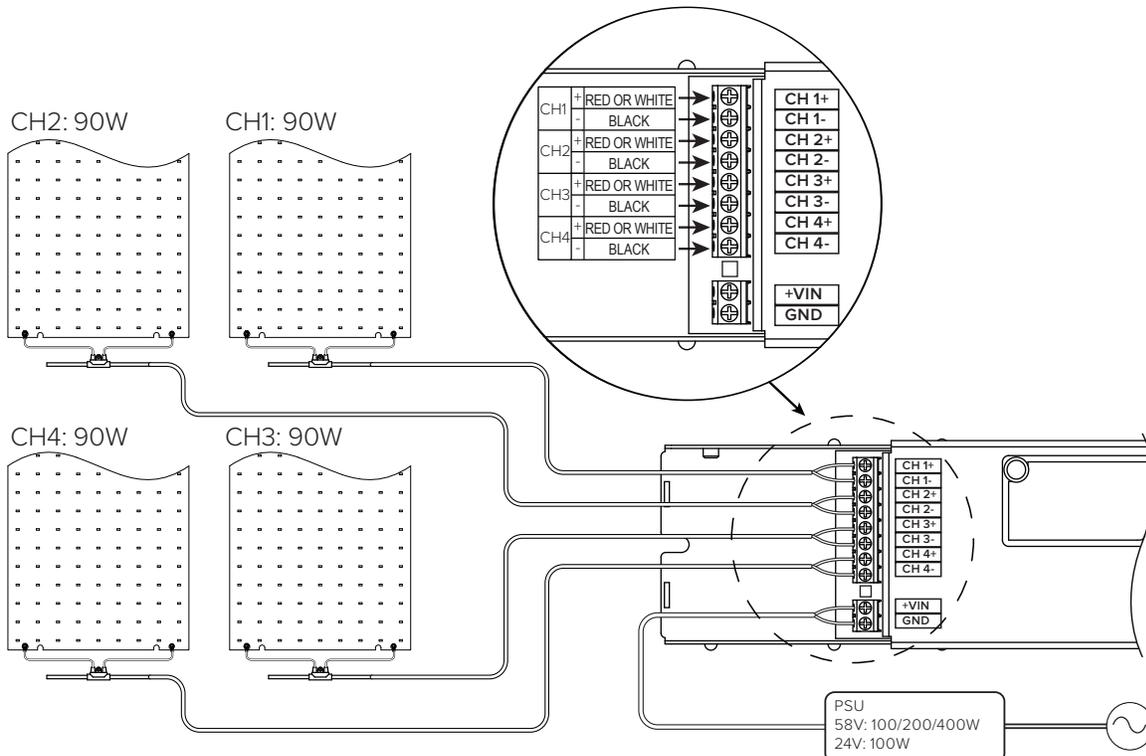
7.3 TUNABLE WHITE (TNW)

Tunable White is a mode in the Control Module to be used in conjunction with TILE Tunable White. Powering the controller in this mode can be done with 58V *100W/200W/400W drivers. A 400W driver can power up to 2 Control Modules, refer to section 6.0..

Dimming Protocol	Mode Switches 1-3
0/1 - 10V TNW	0-1-0
DALI TNW	0-1-0
DMX TNW	0-1-0
Wireless TNW	0-1-0

INPUTS
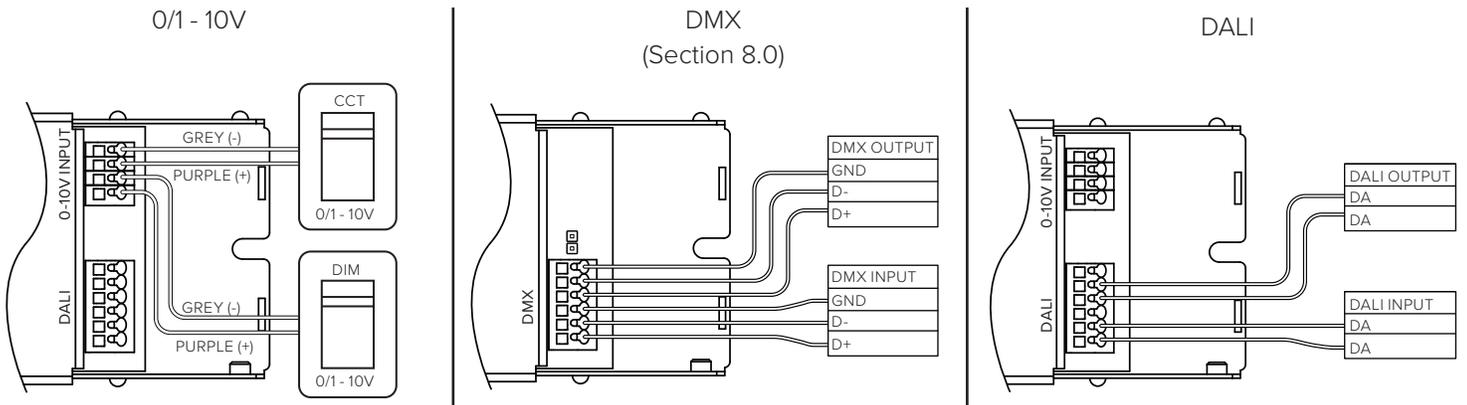
DIM 10V = 100% Brightness
CCT 10V = Cool (5700K)

OUTPUTS

Refer to section 7.5 for wireless
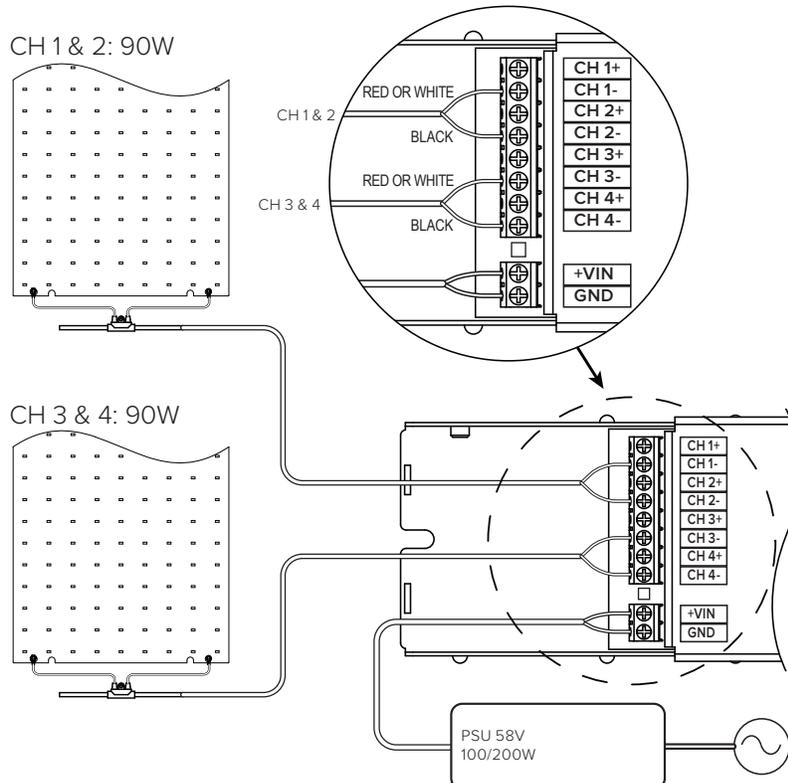
7.4 DIM-TO-WARM (DTW)

Dim-to-Warm is a mode in the Control Module to be used in conjunction with the Dim-to-Warm option of TILE Tunable White. In this mode the CCT will adjust from 2200K at lowest dim setting to 3500K at the highest dim setting. This mode can be used with 58V *100/200/400W systems. A 400W driver can power up to 2 Control Modules, refer to section 6.0

Dimming Protocol	Mode Switches 1-3
0/1 - 10V DTW	0-1-1
DALI DTW	0-1-1
DMX DTW	0-1-1
Wireless DTW	0-1-1

INPUTS
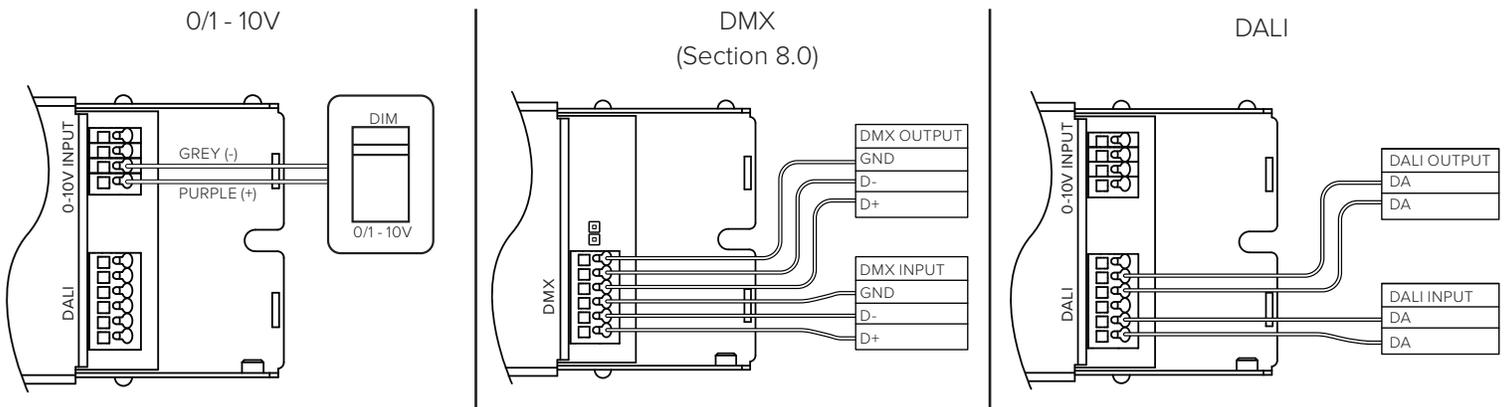
DIM 10V = 100% Brightness 3500K

OUTPUTS

Refer to section 7.5 for wireless
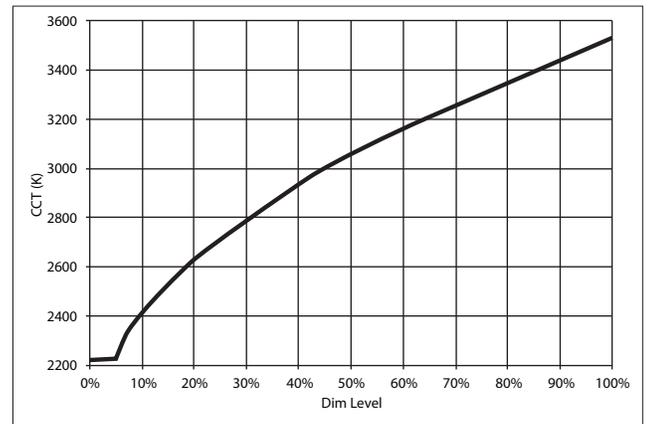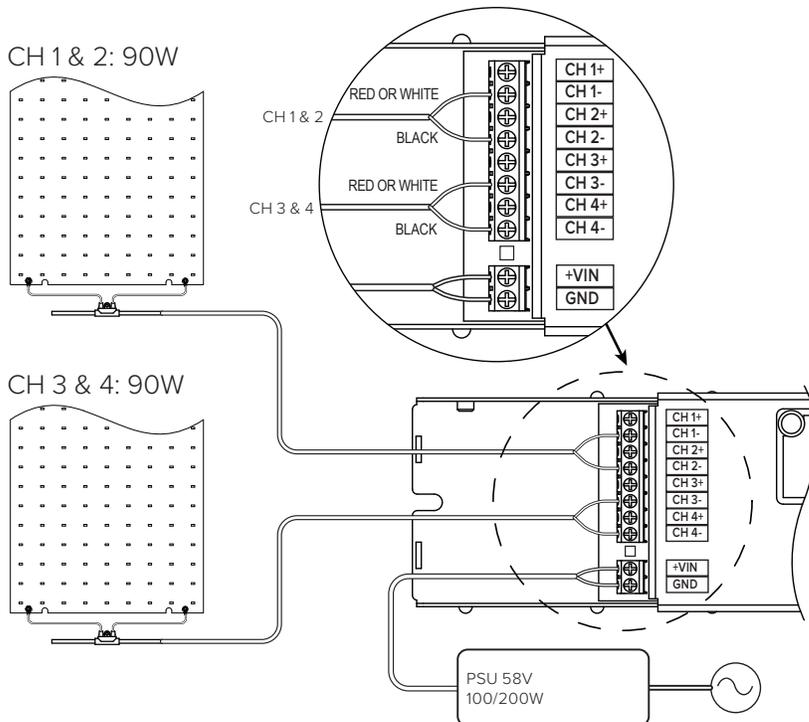
Figure 1: Dim Inputs vs CCT Output

The Cooledge Control Module is capable of wireless control through the Casambi app (free on IOS and Android Devices). To download the Casambi App and access other relevant documentation please visit www.casambi.com/downloads.html.

| Smartwatch | Smartphone | Tablet |
| Push button | Xpress | Switch |
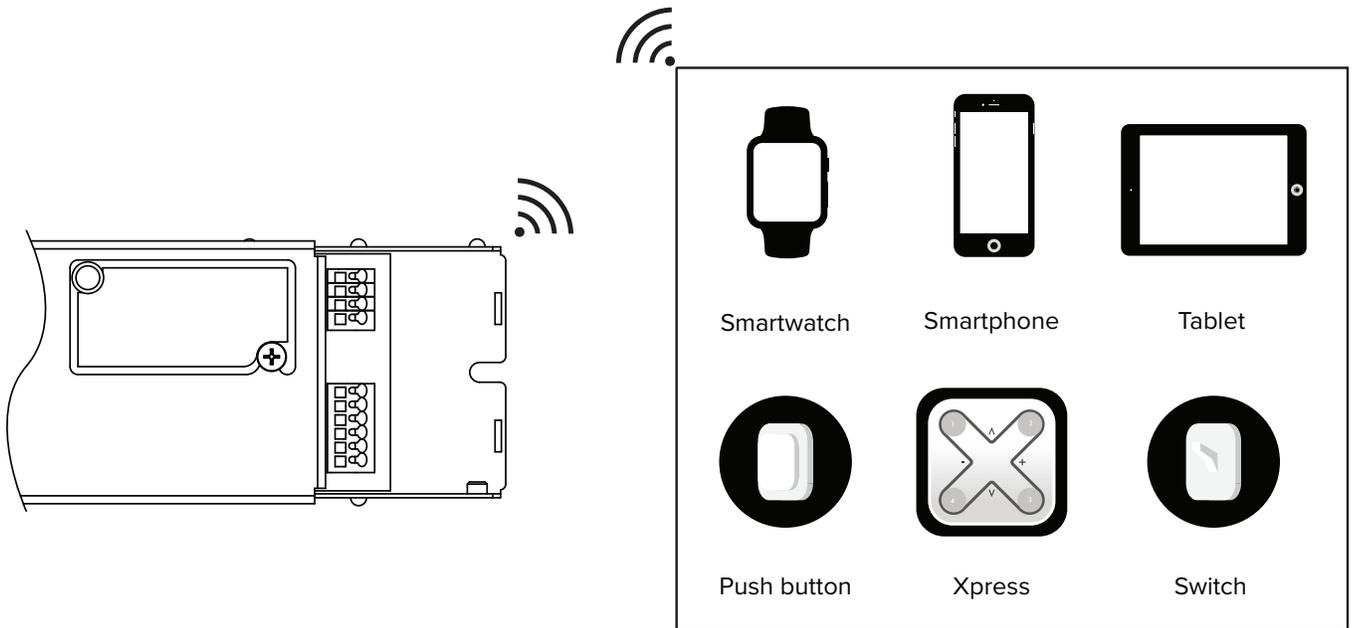
The Cooledge Control Module enables the use of Casambi enabled devices such as smartphones, tablets, or wireless switches to program and/or control dimming and CCT tuning of Cooledge products. This functionality allows the user to set scenes or dynamically control the lighting without the use of a third party controller.

Wireless card found under Cooledge Cover
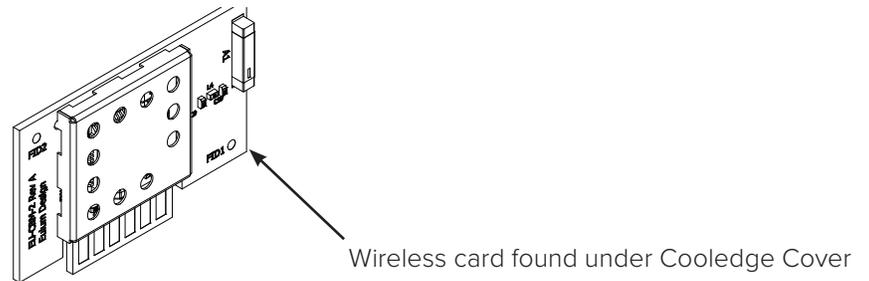
Wireless models of Cooledge Control Module are shipped with a factory-installed card that enables the Casambi functionality. It is possible to convert a DALI model to a wireless model by installing this card. Conversely, it is possible to convert a wireless model to a DALI or 0/1-10V model by removing the card found in the location indicated in the illustration below. When inserting the wireless card do so with the component side towards the DIP switch.
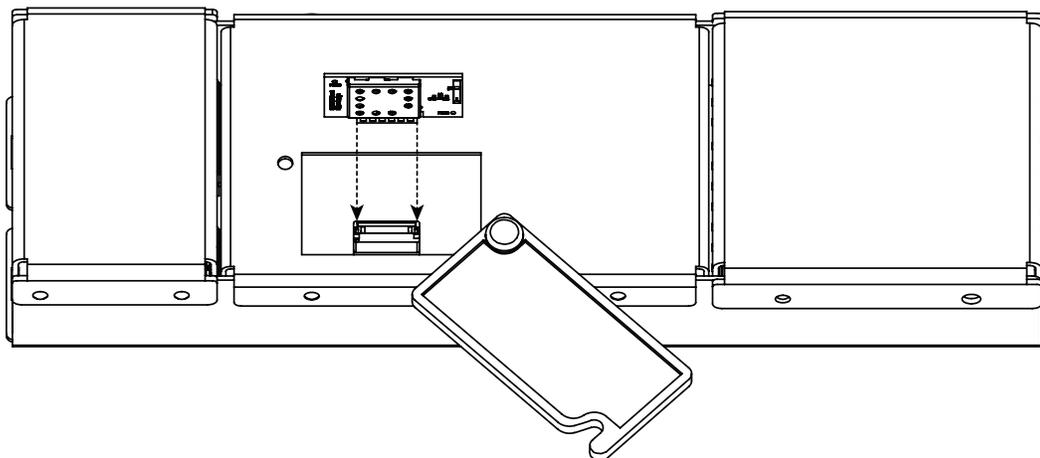
Consult the "Short User Guide to the Casambi App" at https://casambi.com/static/datasheets/short-user-guide.pdf" for additional information related to setting up and using Casambi.

The Cooledge Control Module has custom profiles which are used when in Tunable White mode and Dim-to-Warm mode. When accessing the controller using the Casambi app the main screen will look similar to Figure 2 for a single Control Module connected to a network.

Figure 2: Network home window

To precisely control the lighting elements press and hold the Control Module image, this will show up to 4 sliders to adjust output values. Pressing the numeric value will allow the operator to type in a specific value. Alternatively for quick dimming adjustment, select the controller and pan left or right on the screen to adjust the dimming level across all systems connected.

In static color temperature mode (SCT), it is possible to control up to 4 systems Independently on Control Module. The image below shows the adjustment sliders for SCT set Controllers.
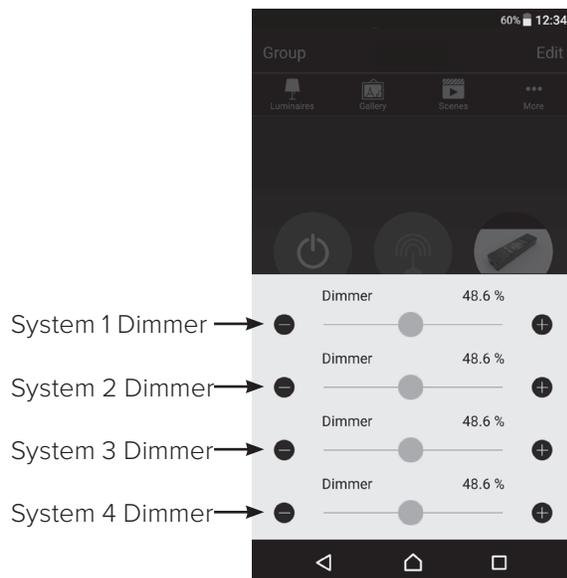
Figure 3: SCT Dimming

In Tunable White (TW) and Dim-to-Warm (DTW) mode it is possible to control up to two systems from a single Control Module
The images below shows the adjustment sliders for TW (Left) and DTW (Right).
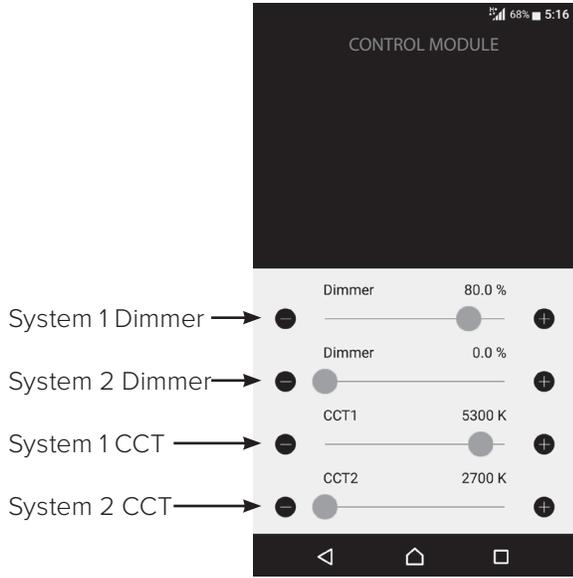
Figure 4: Tunable White
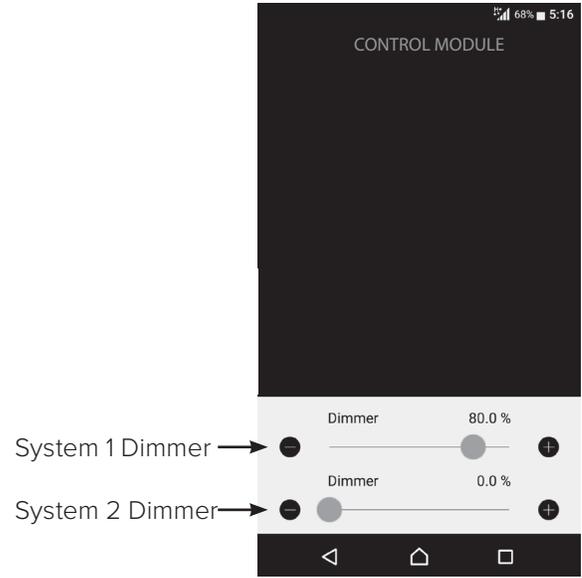
Figure 5: Dim-to-Warm

Standalone mode gives a pre-defined user-selectable fixed dimming and/or color output. No external control input is required for SCT models. There are two different Dimming curves available; log and linear. Refer to appendix A for log intensity values, and appendix B for linear intensity values.

Standalone SCT	Mode Switches 1-3	Switches 4-12 (Intensity)
Fixed Dimming Level - LOG	1-0-0	X-X-X-X-X-X-X-X-0
Fixed Dimming Level - LINEAR	1-0-0	X-X-X-X-X-X-X-X-1
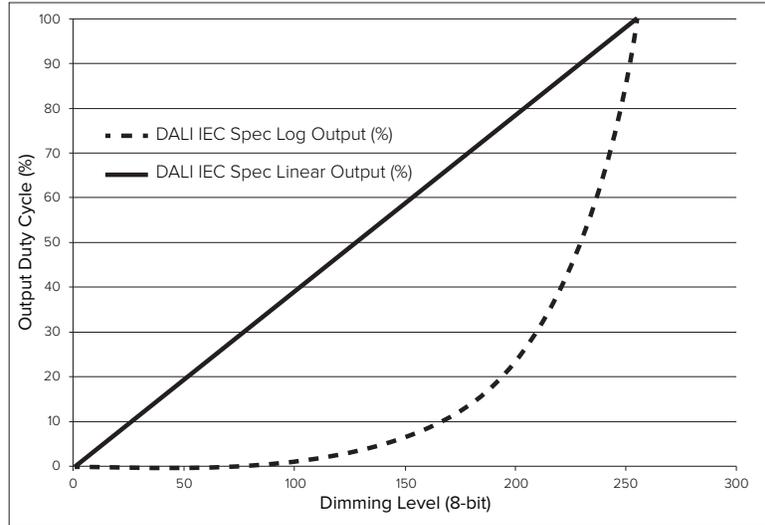
Figure 6: Dimming vs Output duty cycle, logarithmic and linear

Standalone TNW/DTW Chart	Mode Switch 1-3	Switches 4-7 (Intensity)	Switches 8-12 (CCT)
Fixed Output - TNW	1-1-0	X-X-X-X	X-X-X-X-0
Fixed Output - DTW	1-1-0	X-X-X-X	X-X-X-X-1

Use the following charts for selecting the fixed output levels for TNW and DTW. Minimum dimming level for TNW is 1%, levels 0-5* will result in 1% intensity for TNW. When using DTW in Standalone mode switches 8-11 are ignored as CCT is not independently adjustable in DTW, the selected intensity will determine the CCT according to Figure 7.

INTENSITY			CCT			
Level	Dip Setting	Output (%)	Level	Dip Setting	Color Temp (K)	
0	0000	0.05*	0	0000	2700	
1	0001	0.16*	1	0001	2850	
2	0010	0.25*	2	0010	3000	
3	0011	0.39*	3	0011	3200	
4	0100	0.62*	4	0100	3400	
5	0101	0.99*	5	0101	3600	
6	0110	1.58	6	0110	3800	
7	0111	2.51	7	0111	4000	
8	1000	3.99	8	1000	4200	
9	1001	6.34	9	1001	4400	
10	1010	10.09	10	1010	4600	
11	1011	16.05	11	1011	4800	
12	1100	25.53	12	1100	5000	
13	1101	40.62	13	1101	5200	
14	1110	64.61	14	1110	5400	
15	1111	100.0	15	1111	5700	

Figure 7: Intensity and CCT selection chart (LEFT), level and output chart (RIGHT)

7.7 DYNAMIC TEST MODE

Dynamic test mode is used to check the system functionality. This mode will ignore control inputs and cycle through the output range.

Standalone SCT	Mode Switches 1-3	Switches 4-12
Dynamic Dimming Level Test (SCT)	1-0-1	IGNORED
Dynamic Color Tune Test (TNW)	1-1-1	IGNORED
Dynamic Dim-to-Warm Test (DTW)	1-1-1	IGNORED

* On = 1, Off = 0

Dynamic test SCT mode:
Outputs operate in standard configuration with the output duty cycle of all 4 channels matching. Output duty cycle starts from 0% and ramps linearly up to 100% output, then ramps back down to 0% and repeats indefinitely with a period of 5 seconds.
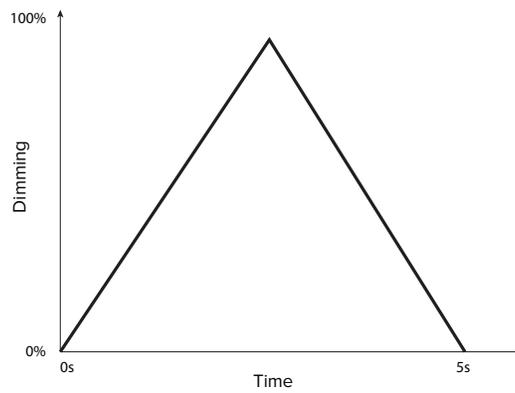
Figure 8: SCT Dynamic test mode output range

Dynamic test TNW/DTW mode:
This test mode is only applicable for TNW and DTW TILEs. Output duty cycle starts with the WARM LEDs (TNW=2700K, DTW=2200K) raising their intensity from 0% to 100% then decreasing to 0%. Next the COOL LEDs (TNW=5700K, DTW =3500K) raise intensity from 0% to 100% then decrease to 0%. This cycle repeats indefinitely with a period of 10 seconds.
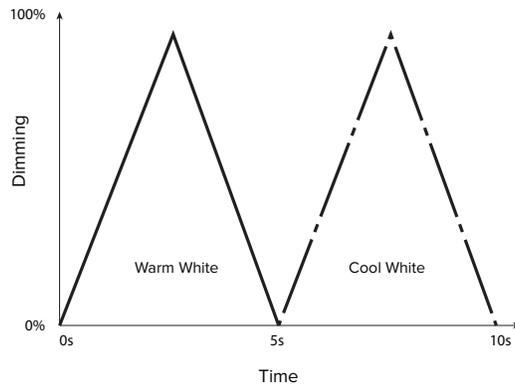
Figure 9: TNW/DTW Dynamic test mode output graph
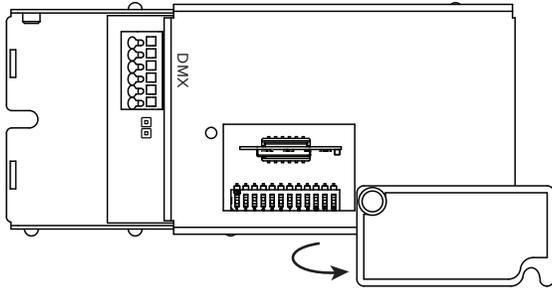
1 = On, 0 = Off
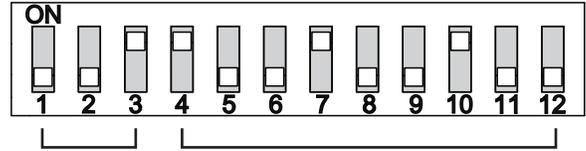
- Switch 1 - 3: Control Module MODE, refer to Mode Section 6.0
- Switches 4 - 12: Addressing switches.

-To access the DIP switch for selecting addresses for DMX controls, unfasten the cover screw and rotate the cover out of the way.
- Each of the 9 switches (4-12) represent a bit in binary representation for the address. See example below.
- Each Control Module can occupy up to 8 addresses depending on the mode selected, refer to appendix C for more details. Addresses 1 through 511 are possible.

Switch:	4	5	6	7	8	9	10	11	12
Binary Value:	256	128	64	32	16	8	4	2	1

Example: Address 377

256 + 64 + 32 + 16 + 8 + 1 = 377

DMX OUTPUT
GND
D-
D+

DMX INPUT
GND
D-
D+
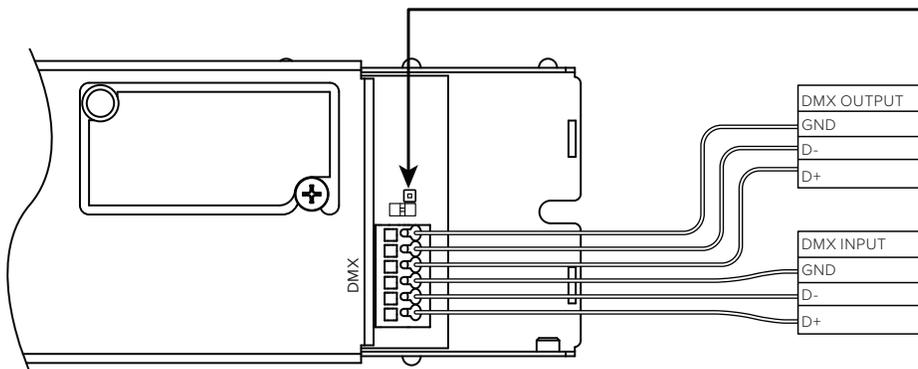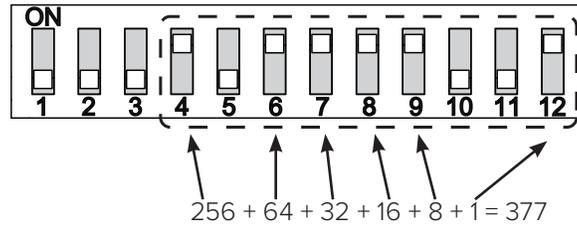
When installing the final controller (termination point) in a DMX network use the provided jumper on the indicated header.
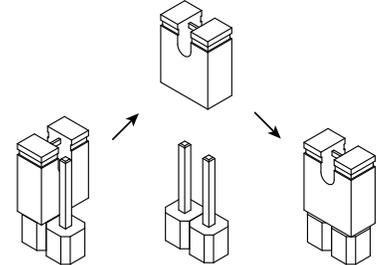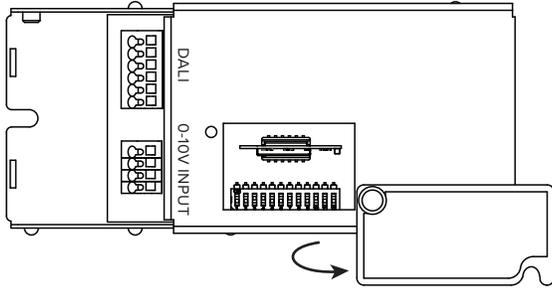
1 = On, 0 = Off
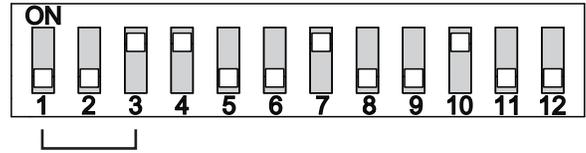
- Switch 1 - 3: Control Module MODE, refer to Mode Section 6.0

- On DALI bus, when commissioned, each Control Module unit will occupy 4 subsequent DALI addresses.
- A total of 64 DALI addresses are allowed on a DALI bus, for a maximum of 16 Control Modules.
- The 64 DALI addresses are numbered from "0" to "63".
- When using the DALI control inputs to the Control Module the DALI bus must be powered before the Control Module. If the bus is not powered before the Control Module the controller will default to 0-10V input and not register DALI inputs.

Static Color Temperature (SCT) DALI Addressing

Channel	Function	Address
1	DIM Channel 1	N
2	DIM Channel 2	N+1
3	DIM Channel 3	N+2
4	DIM Channel 4	N+3

Tunable White (TNW) DALI Addressing

System	Function	Address
1	DIM System 1	N
1	CCT System 1	N+1
2	DIM System 2	N+2
2	CCT System 2	N+3

Dim-To-Warm (DTW) DALI Addressing

Channel	Function	Address
1	DTW System 1	N
2	DTW System 2	N+1
-	Not Used	N+2
-	Not Used	N+3

Example:

A Control Module in DTW mode commissioned with the addresses 24, 25, 26, and 27.

      24 - DIM TW1 Channel
      25 - DIM TW2 Channel
      26 - Not Used
      27 - Not Used

10.0 EXTERIOR APPLICATIONS

For exterior applications, Cooledge Control Module must be enclosed in an IP65 minimum rated enclosure prior to installation. When installing in an exterior location be sure to conform to all local electrical codes

Example: Enclosed Control Module

IP65 Cable Gland or conduit fitting

IP65 enclosure (by others)
Contact Cooledge for recommendation
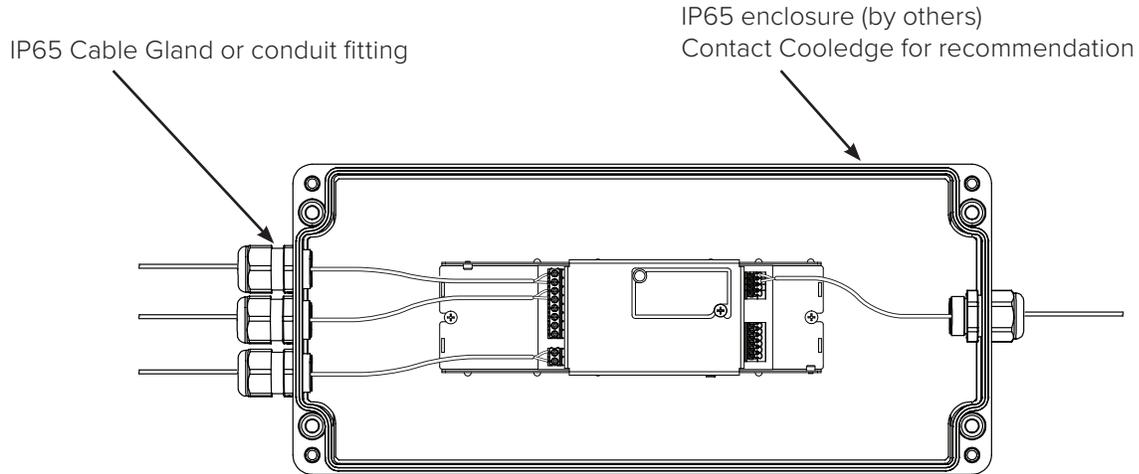
It is the customer's responsibility to cut the necessary holes in the enclosure, and to use an IP rated cable gland or conduit fitting. The wires to and from the Control Module need to be strain relieved. This can be done at either the IP rated enclosure or at the Control Module itself. If strain reliefs are not used on the Control Module, edge protectors should be installed to protect wires from sharp edges, or remove the terminal block covers.

DALI/0-10V AND CASAMBI MODULE

Load Behavior	Controller Status	LED State
Loads OFF	OFF (No Input Power)	OFF
Responsive to Dali commands	DALI Input Recognized	Green Flashing Slow (1Hz)
Responsive to Casambi commands	Casambi Input Recognized	Green Flashing Fast (8Hz)
Responsive to 0-10V commands	0-10V Control Input Recognized	Green On Steady State
Responsive only to DIP switch setting	Standalone Recognized	Alternate Amber/Green Slow (1Hz)
Full ON	No Control Input	Amber On Steady State
Loads OFF	Input Over Voltage/ 0-10V input set at 10V	Amber Flashing Slow (1Hz)
Loads OFF	Input Under Voltage	Amber Flashing Fast (8Hz)
A load from a control unit is off and the rest are flashing. Rest of units remain responsive to DALI commands.	Shorting between V- to V+ of the off channel.	N/A
SCT or Standalone mode, two channels are dim and flashing, other channels unaffected.	Shorting of channels, V- to V- of dim and flashing channels	N/A
SCT of Standalone mode, 24V Unit. All channels flashing, one channel flashing at a dimmed level.	Shorting of channels V- to V+, check dim flashing channel.	N/A
The load is OFF on one TW/DTW channel. All the other channels of the unit are flashing. The rest of the units remain responsive to DALI/0-10V/Casambi commands.	Shorting of channels to V+, check the off channel.	N/A
A channel fully dimmed and flashing a 1Hz. The rest of the loads remain responsive to DALI/0-10V/Casambi commands.	Output Overload	N/A
DALI commands unresponsive.	Control Module powered before DALI bus.	N/A

DMX MODULE

Load Behavior	Controller Status	LED State
Loads OFF	OFF (No Input Power)	OFF
Responsive to DMX commands	DMX Input Recognized	Green On Steady State
Full ON, not responsive to DMX commands	DMX Input Missing	Amber On Steady State
Responsive only to DIP switch Setting	Standalone Mode Recognized	Alternate Amber/Green Slow (1Hz)
Loads OFF	Input Over Voltage	Amber Flashing Slow (1Hz)
Loads OFF	Input Under Voltage	Amber Flashing Fast (8Hz)
A load from a control unit is off and the rest are flashing. Rest of units remain responsive to DMX commands.	Shorting between V- to V+ of the off channel.	N/A
SCT or Standalone mode, two channels are dim and flashing, other channels unaffected.	Shorting of channels, V- to V-, check dim and flashing channels	N/A
SCT or Standalone mode, 24V Unit. All channels flashing, one channel flashing at a dimmed level.	Shorting of channels, V- to V+, check dim and flashing channel.	N/A
Load is OFF on one TW/DTW channel. All loads of the unit, except the shorted one, are flashing. The rest of the units remain Responsive to DMX commands.	Shorting of channels to V+, check the off channel.	N/A
Channel fully dimmed and flashing at 1Hz. Rest of the loads remain responsive to DMX commands.	Output Overload	N/A

For additional troubleshooting guidance regarding Casambi app visit the web page:
http://support.casambi.com/support/home

APPENDIX A: LOGARITHMIC DIMMING LEVELS SCT

Level	DIP SETTING	Output(%)	Level	DIP SETTING	Output(%)	Level	DIP SETTING	Output(%)	Level	DIP SETTING	Output(%)	Level	DIP SETTING	Output(%)
0	00000000	0	51	00110011	0.392	102	01100110	1.576	153	10011001	6.344	204	11001100	25.534
1	00000001	0.100	52	00110100	0.402	103	01100111	1.620	154	10011010	6.520	205	11001101	26.241
2	00000010	0.103	53	00110101	0.414	104	01101000	1.665	155	10011011	6.700	206	11001110	26.967
3	00000011	0.106	54	00110110	0.425	105	01101001	1.711	156	10011100	6.886	207	11001111	27.713
4	00000100	0.109	55	00110111	0.437	106	01101010	1.758	157	10011101	7.076	208	11010000	28.480
5	00000101	0.112	56	00111000	0.449	107	01101011	1.807	158	10011110	7.272	209	11010001	29.269
6	00000110	0.115	57	00111001	0.461	108	01101100	1.857	159	10011111	7.473	210	11010010	30.079
7	00000111	0.118	58	00111010	0.474	109	01101101	1.908	160	10100000	7.680	211	11010011	30.911
8	00001000	0.121	59	00111011	0.487	110	01101110	1.961	161	10100001	7.893	212	11010100	31.767
9	00001001	0.124	60	00111100	0.501	111	01101111	2.015	162	10100010	8.111	213	11010101	32.646
10	00001010	0.128	61	00111101	0.515	112	01110000	2.071	163	10100011	8.336	214	11010110	33.550
11	00001011	0.131	62	00111110	0.529	113	01110001	2.128	164	10100100	8.567	215	11010111	34.479
12	00001100	0.135	63	00111111	0.543	114	01110010	2.187	165	10100101	8.804	216	11011000	35.433
13	00001101	0.139	64	01000000	0.559	115	01110011	2.248	166	10100110	9.047	217	11011001	36.414
14	00001110	0.143	65	01000001	0.574	116	01110100	2.310	167	10100111	9.298	218	11011010	37.422
15	00001111	0.147	66	01000010	0.590	117	01110101	2.374	168	10101000	9.555	219	11011011	38.457
16	00010000	0.151	67	01000011	0.606	118	01110110	2.440	169	10101001	9.820	220	11011100	39.522
17	00010001	0.155	68	01000100	0.623	119	01110111	2.507	170	10101010	10.091	221	11011101	40.616
18	00010010	0.159	69	01000101	0.640	120	01111000	2.577	171	10101011	10.371	222	11011110	41.740
19	00010011	0.163	70	01000110	0.658	121	01111001	2.648	172	10101100	10.658	223	11011111	42.895
20	00010100	0.168	71	01000111	0.676	122	01111010	2.721	173	10101101	10.953	224	11100000	44.083
21	00010101	0.173	72	01001000	0.695	123	01111011	2.797	174	10101110	11.256	225	11100001	45.303
22	00010110	0.177	73	01001001	0.714	124	01111100	2.874	175	10101111	11.568	226	11100010	46.557
23	00010111	0.182	74	01001010	0.734	125	01111101	2.954	176	10110000	11.888	227	11100011	47.846
24	00011000	0.187	75	01001011	0.754	126	01111110	3.035	177	10110001	12.217	228	11100100	49.170
25	00011001	0.193	76	01001100	0.775	127	01111111	3.119	178	10110010	12.555	229	11100101	50.531
26	00011010	0.198	77	01001101	0.796	128	10000000	3.206	179	10110011	12.902	230	11100110	51.930
27	00011011	0.203	78	01001110	0.819	129	10000001	3.294	180	10110100	13.260	231	11100111	53.367
28	00011100	0.209	79	01001111	0.841	130	10000010	3.386	181	10110101	13.627	232	11101000	54.844
29	00011101	0.215	80	01010000	0.864	131	10000011	3.479	182	10110110	14.004	233	11101001	56.362
30	00011110	0.221	81	01010001	0.888	132	10000100	3.576	183	10110111	14.391	234	11101010	57.922
31	00011111	0.227	82	01010010	0.913	133	10000101	3.675	184	10111000	14.790	235	11101011	59.526
32	00100000	0.233	83	01010011	0.938	134	10000110	3.776	185	10111001	15.199	236	11101100	61.173
33	00100001	0.240	84	01010100	0.964	135	10000111	3.881	186	10111010	15.620	237	11101101	62.866
34	00100010	0.246	85	01010101	0.991	136	10001000	3.988	187	10111011	16.052	238	11101110	64.607
35	00100011	0.253	86	01010110	1.018	137	10001001	4.099	188	10111100	16.496	239	11101111	66.395
36	00100100	0.260	87	01010111	1.047	138	10001010	4.212	189	10111101	16.953	240	11110000	68.233
37	00100101	0.267	88	01011000	1.076	139	10001011	4.329	190	10111110	17.422	241	11110001	70.121
38	00100110	0.275	89	01011001	1.105	140	10001100	4.449	191	10111111	17.905	242	11110010	72.062
39	00100111	0.282	90	01011010	1.136	141	10001101	4.572	192	11000000	18.400	243	11110011	74.057
40	00101000	0.290	91	01011011	1.167	142	10001110	4.698	193	11000001	18.909	244	11110100	76.107
41	00101001	0.298	92	01011100	1.200	143	10001111	4.828	194	11000010	19.433	245	11110101	78.213
42	00101010	0.306	93	01011101	1.233	144	10010000	4.962	195	11000011	19.971	246	11110110	80.378
43	00101011	0.315	94	01011110	1.267	145	10010001	5.099	196	11000100	20.524	247	11110111	82.603
44	00101100	0.324	95	01011111	1.302	146	10010010	5.240	197	11000101	21.092	248	11111000	84.889
45	00101101	0.332	96	01100000	1.338	147	10010011	5.385	198	11000110	21.675	249	11111001	87.239
46	00101110	0.342	97	01100001	1.375	148	10010100	5.535	199	11000111	22.275	250	11111010	89.654
47	00101111	0.351	98	01100010	1.413	149	10010101	5.688	200	11001000	22.892	251	11111011	92.135
48	00110000	0.361	99	01100011	1.452	150	10010110	5.845	201	11001001	23.526	252	11111100	94.686
49	00110001	0.371	100	01100100	1.492	151	10010111	6.007	202	11001010	24.177	253	11111101	97.307
50	00110010	0.381	101	01100101	1.534	152	10011000	6.173	203	11001011	24.846	254	11111110	100.000

APPENDIX B: LINEAR DIMMING LEVELS SCT

Level	DIP SETTING	Output (%)	Level	DIP SETTING	Output (%)	Level	DIP SETTING	Output (%)	Level	DIP SETTING	Output (%)	Level	DIP SETTING	Output (%)
0	00000000	0	51	00110011	20.1	102	01100110	40.2	153	10011001	60.2	204	11001100	80.3
1	00000001	0.4	52	00110100	20.5	103	01100111	40.6	154	10011010	60.6	205	11001101	80.7
2	00000010	0.8	53	00110101	20.9	104	01101000	40.9	155	10011011	61.0	206	11001110	81.1
3	00000011	1.2	54	00110110	21.3	105	01101001	41.3	156	10011100	61.4	207	11001111	81.5
4	00000100	1.6	55	00110111	21.7	106	01101010	41.7	157	10011101	61.8	208	11010000	81.9
5	00000101	2.0	56	00111000	22.0	107	01101011	42.1	158	10011110	62.2	209	11010001	82.3
6	00000110	2.4	57	00111001	22.4	108	01101100	42.5	159	10011111	62.6	210	11010010	82.7
7	00000111	2.8	58	00111010	22.8	109	01101101	42.9	160	10100000	63.0	211	11010011	83.1
8	00001000	3.1	59	00111011	23.2	110	01101110	43.3	161	10100001	63.4	212	11010100	83.5
9	00001001	3.5	60	00111100	23.6	111	01101111	43.7	162	10100010	63.8	213	11010101	83.9
10	00001010	3.9	61	00111101	24.0	112	01110000	44.1	163	10100011	64.2	214	11010110	84.3
11	00001011	4.3	62	00111110	24.4	113	01110001	44.5	164	10100100	64.6	215	11010111	84.6
12	00001100	4.7	63	00111111	24.8	114	01110010	44.9	165	10100101	65.0	216	11011000	85.0
13	00001101	5.1	64	01000000	25.2	115	01110011	45.3	166	10100110	65.4	217	11011001	85.4
14	00001110	5.5	65	01000001	25.6	116	01110100	45.7	167	10100111	65.7	218	11011010	85.8
15	00001111	5.9	66	01000010	26.0	117	01110101	46.1	168	10101000	66.1	219	11011011	86.2
16	00010000	6.3	67	01000011	26.4	118	01110110	46.5	169	10101001	66.5	220	11011100	86.6
17	00010001	6.7	68	01000100	26.8	119	01110111	46.9	170	10101010	66.9	221	11011101	87.0
18	00010010	7.1	69	01000101	27.2	120	01111000	47.2	171	10101011	67.3	222	11011110	87.4
19	00010011	7.5	70	01000110	27.6	121	01111001	47.6	172	10101100	67.7	223	11011111	87.8
20	00010100	7.9	71	01000111	28.0	122	01111010	48.0	173	10101101	68.1	224	11100000	88.2
21	00010101	8.3	72	01001000	28.3	123	01111011	48.4	174	10101110	68.5	225	11100001	88.6
22	00010110	8.7	73	01001001	28.7	124	01111100	48.8	175	10101111	68.9	226	11100010	89.0
23	00010111	9.1	74	01001010	29.1	125	01111101	49.2	176	10110000	69.3	227	11100011	89.4
24	00011000	9.4	75	01001011	29.5	126	01111110	49.6	177	10110001	69.7	228	11100100	89.8
25	00011001	9.8	76	01001100	29.9	127	01111111	50.0	178	10110010	70.1	229	11100101	90.2
26	00011010	10.2	77	01001101	30.3	128	10000000	50.4	179	10110011	70.5	230	11100110	90.6
27	00011011	10.6	78	01001110	30.7	129	10000001	50.8	180	10110100	70.9	231	11100111	90.9
28	00011100	11.0	79	01001111	31.1	130	10000010	51.2	181	10110101	71.3	232	11101000	91.3
29	00011101	11.4	80	01010000	31.5	131	10000011	51.6	182	10110110	71.7	233	11101001	91.7
30	00011110	11.8	81	01010001	31.9	132	10000100	52.0	183	10110111	72.0	234	11101010	92.1
31	00011111	12.2	82	01010010	32.3	133	10000101	52.4	184	10111000	72.4	235	11101011	92.5
32	00100000	12.6	83	01010011	32.7	134	10000110	52.8	185	10111001	72.8	236	11101100	92.9
33	00100001	13.0	84	01010100	33.1	135	10000111	53.1	186	10111010	73.2	237	11101101	93.3
34	00100010	13.4	85	01010101	33.5	136	10001000	53.5	187	10111011	73.6	238	11101110	93.7
35	00100011	13.8	86	01010110	33.9	137	10001001	53.9	188	10111100	74.0	239	11101111	94.1
36	00100100	14.2	87	01010111	34.3	138	10001010	54.3	189	10111101	74.4	240	11110000	94.5
37	00100101	14.6	88	01011000	34.6	139	10001011	54.7	190	10111110	74.8	241	11110001	94.9
38	00100110	15.0	89	01011001	35.0	140	10001100	55.1	191	10111111	75.2	242	11110010	95.3
39	00100111	15.4	90	01011010	35.4	141	10001101	55.5	192	11000000	75.6	243	11110011	95.7
40	00101000	15.7	91	01011011	35.8	142	10001110	55.9	193	11000001	76.0	244	11110100	96.1
41	00101001	16.1	92	01011100	36.2	143	10001111	56.3	194	11000010	76.4	245	11110101	96.5
42	00101010	16.5	93	01011101	36.6	144	10010000	56.7	195	11000011	76.8	246	11110110	96.9
43	00101011	16.9	94	01011110	37.0	145	10010001	57.1	196	11000100	77.2	247	11110111	97.2
44	00101100	17.3	95	01011111	37.4	146	10010010	57.5	197	11000101	77.6	248	11111000	97.6
45	00101101	17.7	96	01100000	37.8	147	10010011	57.9	198	11000110	78.0	249	11111001	98.0
46	00101110	18.1	97	01100001	38.2	148	10010100	58.3	199	11000111	78.3	250	11111010	98.4
47	00101111	18.5	98	01100010	38.6	149	10010101	58.7	200	11001000	78.7	251	11111011	98.8
48	00110000	18.9	99	01100011	39.0	150	10010110	59.1	201	11001001	79.1	252	11111100	99.2
49	00110001	19.3	100	01100100	39.4	151	10010111	59.4	202	11001010	79.5	253	11111101	99.6
50	00110010	19.7	101	01100101	39.8	152	10011000	59.8	203	11001011	79.9	254	11111110	100.0

APPENDIX C: DMX ADDRESSES

The Controller DMX address is set using DIP switches 4 - 12, with the "ON" position = 1, and "OFF" position = 0. Each Control Module will occupy 3 - 7 subsequent DMX addresses, depending on the type of mode the controller is in. SCT will have a total of 8 addresses, TNW will have a total of 8 addresses, and DTW will have a total of 4 addresses. Addresses 1 - 511 are avaliable. Address "0" is not a valid address.

Static Color Temperature (SCT) DMX Addressing

Channel	Dimming Resolution	Address
1	DIM Coarse	N
1	DIM Fine	N+1
2	DIM Coarse	N+2
2	DIM Fine	N+3
3	DIM Coarse	N+4
3	DIM Fine	N+5
4	DIM Coarse	N+6
4	DIM Fine	N+7

Tunable White (TNW) DMX Addressing

Channel	Dimming Resolution	Address
1	DIM Coarse	N
1	DIM Fine	N+1
1	CCT Coarse	N+2
1	CCT Fine	N+3
2	DIM Coarse	N+4
2	DIM Fine	N+5
2	CCT Coarse	N+6
2	CCT Fine	N+7

Dim-to-Warm (DTW) DMX Addressing

Channel	Dimming Resolution	Address
1	DIM Coarse	N
1	DIM Fine	N+1
2	DIM Coarse	N+2
2	DIM Fine	N+3

Example:
A TNW Control Module with one 90W load, with address of 42. Looking at the Tunable White DMX addressing table with N = 42 and only 1 system being controlled, the Control Module would also occupy addresses 43, 44, 45, 46, 47, 48, and 49.

32 + 8 + 2 = 42
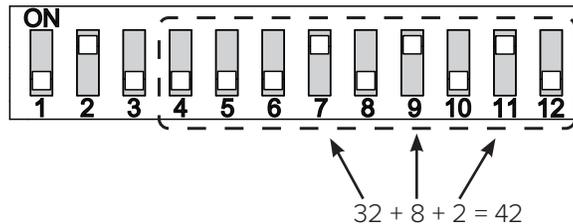
APPENDIX D: 0 -10V CONTROL PROTOCOL

Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)
0.0	0.00	0.0	2700	3.4	2.98	3.4	3419	6.8	20.90	6.8	4699
0.1	0.00	0.1	2700	3.5	3.15	3.5	3457	6.9	22.07	6.9	4737
0.2	0.00	0.2	2700	3.6	3.32	3.6	3495	7.0	23.31	7.0	4774
0.3	0.00	0.3	2700	3.7	3.51	3.7	3532	7.1	25.07	7.1	4812
0.4	0.00	0.4	2700	3.8	3.71	3.8	3570	7.2	26.48	7.2	4850
0.5	0.00	0.5	2700	3.9	3.92	3.9	3607	7.3	27.97	7.3	4887
0.6	0.00	0.6	2700	4.0	4.21	4.0	3645	7.4	29.54	7.4	4925
0.7	0.00	0.7	2700	4.1	4.45	4.1	3683	7.5	31.19	7.5	4963
0.8	0.00	0.8	2700	4.2	4.70	4.2	3720	7.6	32.94	7.6	5000
0.9	0.00	0.9	2700	4.3	4.96	4.3	3758	7.7	35.43	7.7	5038
1.0	0.00	1.0	2700	4.4	5.24	4.4	3796	7.8	37.42	7.8	5076
1.1	0.00	1.1	2700	4.5	5.53	4.5	3833	7.9	39.52	7.9	5113
1.2	0.00	1.2	2700	4.6	5.95	4.6	3871	8.0	41.74	8.0	5151
1.3	0.00	1.3	2700	4.7	6.29	4.7	3909	8.1	44.08	8.1	5189
1.4	0.00	1.4	2700	4.8	6.64	4.8	3946	8.2	46.56	8.2	5226
1.5	1.00	1.5	2700	4.9	7.01	4.9	3984	8.3	50.07	8.3	5264
1.6	1.06	1.6	2742	5.0	7.41	5.0	4022	8.4	52.88	8.4	5301
1.7	1.12	1.7	2779	5.1	7.82	5.1	4059	8.5	55.85	8.5	5339
1.8	1.18	1.8	2817	5.2	8.41	5.2	4097	8.6	58.99	8.6	5377
1.9	1.24	1.9	2855	5.3	8.88	5.3	4134	8.7	62.30	8.7	5414
2.0	1.31	2.0	2892	5.4	9.38	5.4	4172	8.8	65.79	8.8	5452
2.1	1.39	2.1	2930	5.5	9.91	5.5	4210	8.9	70.76	8.9	5490
2.2	1.49	2.2	2967	5.6	10.47	5.6	4247	9.0	74.73	9.0	5527
2.3	1.58	2.3	3005	5.7	11.05	5.7	4285	9.1	78.93	9.1	5565
2.4	1.66	2.4	3043	5.8	11.67	5.8	4323	9.2	83.36	9.2	5603
2.5	1.76	2.5	3080	5.9	12.55	5.9	4360	9.3	88.04	9.3	5640
2.6	1.86	2.6	3118	6.0	13.26	6.0	4398	9.4	92.98	9.4	5678
2.7	1.96	2.7	3156	6.1	14.00	6.1	4436	9.5	100.00	9.5	5700
2.8	2.11	2.8	3193	6.2	14.79	6.2	4473	9.6	100.00	9.6	5700
2.9	2.23	2.9	3231	6.3	15.62	6.3	4511	9.7	100.00	9.7	5700
3.0	2.35	3.0	3269	6.4	16.50	6.3	4549	9.8	100.00	9.8	5700
3.1	2.48	3.1	3306	6.5	17.74	6.4	4586	9.9	100.00	9.9	5700
3.2	2.62	3.2	3344	6.6	18.74	6.5	4624	10.0	100.00	10.0	5700
3.3	2.77	3.3	3382	6.7	19.79	6.6	4662				

Dimming Response

Color Temperature Response

APPENDIX E: DALI CONTROL PROTOCOL

Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)
0	0.00	0	2700	57	2.77	57	3373	114	7.82	114	4046
1	1.00	1	2712	58	2.82	58	3385	115	7.96	115	4058
2	1.02	2	2724	59	2.87	59	3397	116	8.11	116	4070
3	1.04	3	2735	60	2.93	60	3409	117	8.26	117	4082
4	1.06	4	2747	61	2.98	61	3420	118	8.41	118	4094
5	1.08	5	2759	62	3.04	62	3432	119	8.57	119	4106
6	1.10	6	2771	63	3.09	63	3444	120	8.72	120	4117
7	1.12	7	2783	64	3.15	64	3456	121	8.88	121	4129
8	1.14	8	2794	65	3.21	65	3468	122	9.05	122	4141
9	1.16	9	2806	66	3.26	66	3480	123	9.21	123	4153
10	1.18	10	2818	67	3.32	67	3491	124	9.38	124	4165
11	1.20	11	2830	68	3.39	68	3503	125	9.56	125	4176
12	1.22	12	2842	69	3.45	69	3515	126	9.73	126	4188
13	1.24	13	2854	70	3.51	70	3527	127	9.91	127	4200
14	1.27	14	2865	71	3.58	71	3539	128	10.09	128	4212
15	1.29	15	2877	72	3.64	72	3550	129	10.28	129	4224
16	1.31	16	2889	73	3.71	73	3562	130	10.47	130	4235
17	1.34	17	2901	74	3.78	74	3574	131	10.66	131	4247
18	1.36	18	2913	75	3.85	75	3586	132	10.85	132	4259
19	1.39	19	2924	76	3.92	76	3598	133	11.05	133	4271
20	1.41	20	2936	77	3.99	77	3609	134	11.26	134	4283
21	1.44	21	2948	78	4.06	78	3621	135	11.46	135	4294
22	1.47	22	2960	79	4.14	79	3633	136	11.67	136	4306
23	1.49	23	2972	80	4.21	80	3645	137	11.89	137	4318
24	1.52	24	2983	81	4.29	81	3657	138	12.11	138	4330
25	1.55	25	2995	82	4.37	82	3669	139	12.33	139	4342
26	1.58	26	3007	83	4.45	83	3680	140	12.55	140	4354
27	1.61	27	3019	84	4.53	84	3692	141	12.79	141	4365
28	1.63	28	3031	85	4.61	85	3704	142	13.02	142	4377
29	1.66	29	3043	86	4.70	86	3716	143	13.26	143	4389
30	1.70	30	3054	87	4.78	87	3728	144	13.50	144	4401
31	1.73	31	3066	88	4.87	88	3739	145	13.75	145	4413
32	1.76	32	3078	89	4.96	89	3751	146	14.00	146	4424
33	1.79	33	3090	90	5.05	90	3763	147	14.26	147	4436
34	1.82	34	3102	91	5.15	91	3775	148	14.52	148	4448
35	1.86	35	3113	92	5.24	92	3787	149	14.79	149	4460
36	1.89	36	3125	93	5.34	93	3798	150	15.06	150	4472
37	1.93	37	3137	94	5.43	94	3810	151	15.34	151	4483
38	1.96	38	3149	95	5.53	95	3822	152	15.62	152	4495
39	2.00	39	3161	96	5.64	96	3834	153	15.91	153	4507
40	2.03	40	3172	97	5.74	97	3846	154	16.20	154	4519
41	2.07	41	3184	98	5.85	98	3857	155	16.50	155	4531
42	2.11	42	3196	99	5.95	99	3869	156	16.80	156	4543
43	2.15	43	3208	100	6.06	100	3881	157	17.11	157	4554
44	2.19	44	3220	101	6.17	101	3893	158	17.42	158	4566
45	2.23	45	3231	102	6.29	102	3905	159	17.74	159	4578
46	2.27	46	3243	103	6.40	103	3917	160	18.07	160	4590
47	2.31	47	3255	104	6.52	104	3928	161	18.40	161	4602
48	2.35	48	3267	105	6.64	105	3940	162	18.74	162	4613
49	2.40	49	3279	106	6.76	106	3952	163	19.08	163	4625
50	2.44	50	3291	107	6.89	107	3964	164	19.43	164	4637
51	2.48	51	3302	108	7.01	108	3976	165	19.79	165	4649
52	2.53	52	3314	109	7.14	109	3987	166	20.15	166	4661
53	2.58	53	3326	110	7.27	110	3999	167	20.52	167	4672
54	2.62	54	3338	111	7.41	111	4011	168	20.90	168	4684
55	2.67	55	3350	112	7.54	112	4023	169	21.28	169	4696
56	2.72	56	3361	113	7.68	113	4035	170	21.68	170	4708

APPENDIX E: DALI CONTROL PROTOCOL CONTINUED

Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)
171	22.07	171	4720	200	37.42	200	5062	229	63.44	229	5405
172	22.48	172	4731	201	38.11	201	5074	230	64.61	230	5417
173	22.89	173	4743	202	38.81	202	5086	231	65.79	231	5428
174	23.31	174	4755	203	39.52	203	5098	232	67.00	232	5440
175	23.74	175	4767	204	40.25	204	5109	233	68.23	233	5452
176	24.18	176	4779	205	40.99	205	5121	234	69.49	234	5464
177	24.62	177	4791	206	41.74	206	5133	235	70.76	235	5476
178	25.07	178	4802	207	42.51	207	5145	236	72.06	236	5487
179	25.53	179	4814	208	43.29	208	5157	237	73.39	237	5499
180	26.00	180	4826	209	44.08	209	5169	238	74.73	238	5511
181	26.48	181	4838	210	44.89	210	5180	239	76.11	239	5523
182	26.97	182	4850	211	45.72	211	5192	240	77.50	240	5535
183	27.46	183	4861	212	46.56	212	5204	241	78.93	241	5546
184	27.97	184	4873	213	47.41	213	5216	242	80.38	242	5558
185	28.48	185	4885	214	48.28	214	5228	243	81.85	243	5570
186	29.00	186	4897	215	49.17	215	5239	244	83.36	244	5582
187	29.54	187	4909	216	50.07	216	5251	245	84.89	245	5594
188	30.08	188	4920	217	50.99	217	5263	246	86.45	246	5606
189	30.63	189	4932	218	51.93	218	5275	247	88.04	247	5617
190	31.19	190	4944	219	52.88	219	5287	248	89.65	248	5629
191	31.77	191	4956	220	53.85	220	5298	249	91.30	249	5641
192	32.35	192	4968	221	54.84	221	5310	250	92.98	250	5653
193	32.94	193	4980	222	55.85	222	5322	251	94.69	251	5665
194	33.55	194	4991	223	56.88	223	5334	252	96.43	252	5676
195	34.17	195	5003	224	57.92	224	5346	253	98.20	253	5688
196	34.79	196	5015	225	58.99	225	5357	254	100.00	254	5700
197	35.43	197	5027	226	60.07	226	5369	255	100.00	255	5700
198	36.08	198	5039	227	61.17	227	5381				
199	36.75	199	5050	228	62.30	228	5393				

Dimming Response
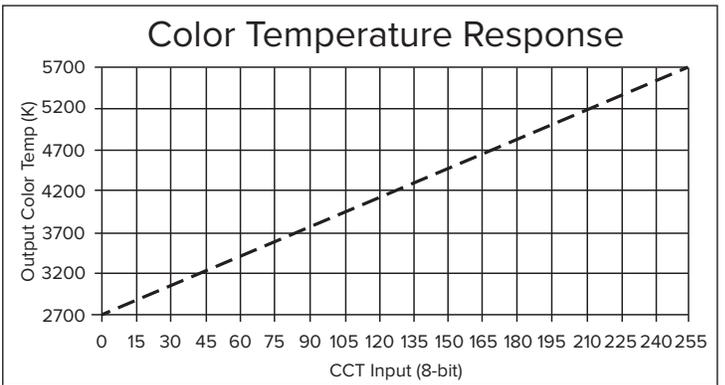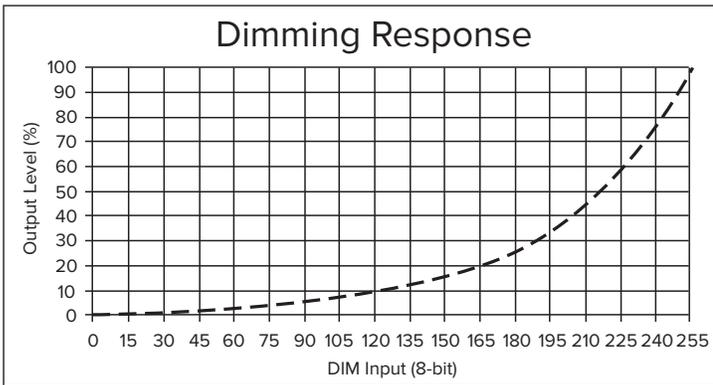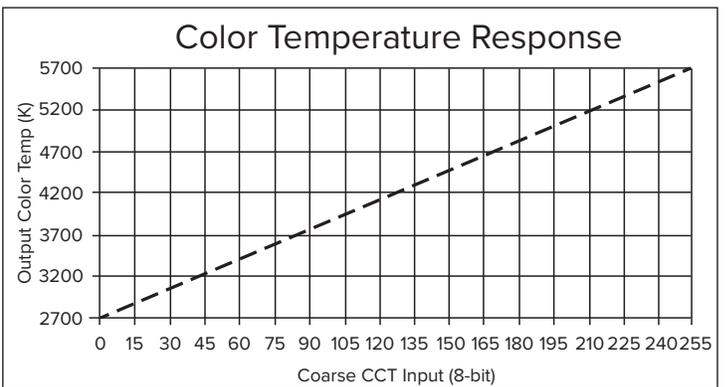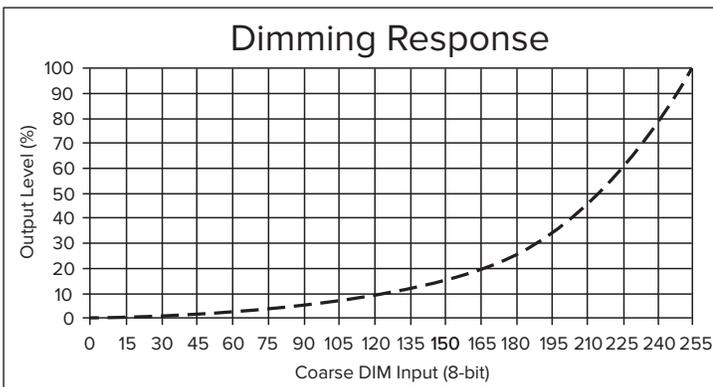

Color Temperature Response

APPENDIX F: DMX CONTROL PROTOCOL

Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)
0	0.00	0	2700	57	2.77	57	3373	114	7.82	114	4046
1	1.00	1	2712	58	2.82	58	3385	115	7.96	115	4058
2	1.02	2	2724	59	2.87	59	3397	116	8.11	116	4070
3	1.04	3	2735	60	2.93	60	3409	117	8.26	117	4082
4	1.06	4	2747	61	2.98	61	3420	118	8.41	118	4094
5	1.08	5	2759	62	3.04	62	3432	119	8.57	119	4106
6	1.10	6	2771	63	3.09	63	3444	120	8.72	120	4117
7	1.12	7	2783	64	3.15	64	3456	121	8.88	121	4129
8	1.14	8	2794	65	3.21	65	3468	122	9.05	122	4141
9	1.16	9	2806	66	3.26	66	3480	123	9.21	123	4153
10	1.18	10	2818	67	3.32	67	3491	124	9.38	124	4165
11	1.20	11	2830	68	3.39	68	3503	125	9.56	125	4176
12	1.22	12	2842	69	3.45	69	3515	126	9.73	126	4188
13	1.24	13	2854	70	3.51	70	3527	127	9.91	127	4200
14	1.27	14	2865	71	3.58	71	3539	128	10.09	128	4212
15	1.29	15	2877	72	3.64	72	3550	129	10.28	129	4224
16	1.31	16	2889	73	3.71	73	3562	130	10.47	130	4235
17	1.34	17	2901	74	3.78	74	3574	131	10.66	131	4247
18	1.36	18	2913	75	3.85	75	3586	132	10.85	132	4259
19	1.39	19	2924	76	3.92	76	3598	133	11.05	133	4271
20	1.41	20	2936	77	3.99	77	3609	134	11.26	134	4283
21	1.44	21	2948	78	4.06	78	3621	135	11.46	135	4294
22	1.47	22	2960	79	4.14	79	3633	136	11.67	136	4306
23	1.49	23	2972	80	4.21	80	3645	137	11.89	137	4318
24	1.52	24	2983	81	4.29	81	3657	138	12.11	138	4330
25	1.55	25	2995	82	4.37	82	3669	139	12.33	139	4342
26	1.58	26	3007	83	4.45	83	3680	140	12.55	140	4354
27	1.61	27	3019	84	4.53	84	3692	141	12.79	141	4365
28	1.63	28	3031	85	4.61	85	3704	142	13.02	142	4377
29	1.66	29	3043	86	4.70	86	3716	143	13.26	143	4389
30	1.70	30	3054	87	4.78	87	3728	144	13.50	144	4401
31	1.73	31	3066	88	4.87	88	3739	145	13.75	145	4413
32	1.76	32	3078	89	4.96	89	3751	146	14.00	146	4424
33	1.79	33	3090	90	5.05	90	3763	147	14.26	147	4436
34	1.82	34	3102	91	5.15	91	3775	148	14.52	148	4448
35	1.86	35	3113	92	5.24	92	3787	149	14.79	149	4460
36	1.89	36	3125	93	5.34	93	3798	150	15.06	150	4472
37	1.93	37	3137	94	5.43	94	3810	151	15.34	151	4483
38	1.96	38	3149	95	5.53	95	3822	152	15.62	152	4495
39	2.00	39	3161	96	5.64	96	3834	153	15.91	153	4507
40	2.03	40	3172	97	5.74	97	3846	154	16.20	154	4519
41	2.07	41	3184	98	5.85	98	3857	155	16.50	155	4531
42	2.11	42	3196	99	5.95	99	3869	156	16.80	156	4543
43	2.15	43	3208	100	6.06	100	3881	157	17.11	157	4554
44	2.19	44	3220	101	6.17	101	3893	158	17.42	158	4566
45	2.23	45	3231	102	6.29	102	3905	159	17.74	159	4578
46	2.27	46	3243	103	6.40	103	3917	160	18.07	160	4590
47	2.31	47	3255	104	6.52	104	3928	161	18.40	161	4602
48	2.35	48	3267	105	6.64	105	3940	162	18.74	162	4613
49	2.40	49	3279	106	6.76	106	3952	163	19.08	163	4625
50	2.44	50	3291	107	6.89	107	3964	164	19.43	164	4637
51	2.48	51	3302	108	7.01	108	3976	165	19.79	165	4649
52	2.53	52	3314	109	7.14	109	3987	166	20.15	166	4661
53	2.58	53	3326	110	7.27	110	3999	167	20.52	167	4672
54	2.62	54	3338	111	7.41	111	4011	168	20.90	168	4684
55	2.67	55	3350	112	7.54	112	4023	169	21.28	169	4696
56	2.72	56	3361	113	7.68	113	4035	170	21.68	170	4708

APPENDIX F: DMX CONTROL PROTOCOL CONTINUED

Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)	Input Dim	Output Level (%)	Input CCT	Output Color Temper (K)
171	22.07	171	4720	200	37.42	200	5062	229	63.44	229	5405
172	22.48	172	4731	201	38.11	201	5074	230	64.61	230	5417
173	22.89	173	4743	202	38.81	202	5086	231	65.79	231	5428
174	23.31	174	4755	203	39.52	203	5098	232	67.00	232	5440
175	23.74	175	4767	204	40.25	204	5109	233	68.23	233	5452
176	24.18	176	4779	205	40.99	205	5121	234	69.49	234	5464
177	24.62	177	4791	206	41.74	206	5133	235	70.76	235	5476
178	25.07	178	4802	207	42.51	207	5145	236	72.06	236	5487
179	25.53	179	4814	208	43.29	208	5157	237	73.39	237	5499
180	26.00	180	4826	209	44.08	209	5169	238	74.73	238	5511
181	26.48	181	4838	210	44.89	210	5180	239	76.11	239	5523
182	26.97	182	4850	211	45.72	211	5192	240	77.50	240	5535
183	27.46	183	4861	212	46.56	212	5204	241	78.93	241	5546
184	27.97	184	4873	213	47.41	213	5216	242	80.38	242	5558
185	28.48	185	4885	214	48.28	214	5228	243	81.85	243	5570
186	29.00	186	4897	215	49.17	215	5239	244	83.36	244	5582
187	29.54	187	4909	216	50.07	216	5251	245	84.89	245	5594
188	30.08	188	4920	217	50.99	217	5263	246	86.45	246	5606
189	30.63	189	4932	218	51.93	218	5275	247	88.04	247	5617
190	31.19	190	4944	219	52.88	219	5287	248	89.65	248	5629
191	31.77	191	4956	220	53.85	220	5298	249	91.30	249	5641
192	32.35	192	4968	221	54.84	221	5310	250	92.98	250	5653
193	32.94	193	4980	222	55.85	222	5322	251	94.69	251	5665
194	33.55	194	4991	223	56.88	223	5334	252	96.43	252	5676
195	34.17	195	5003	224	57.92	224	5346	253	98.20	253	5688
196	34.79	196	5015	225	58.99	225	5357	254	100.00	254	5700
197	35.43	197	5027	226	60.07	226	5369	255	100.00	255	5700
198	36.08	198	5039	227	61.17	227	5381				
199	36.75	199	5050	228	62.30	228	5393				

Dimming Response


Color Temperature Response

APPENDIX G: CASAMBI CONTROL PROTOCOL DIMMING OUTPUT

| Input Dim	Output Level (%)	Perceived Output (%)	Input Dim	Output Level (%)	Perceived Output (%)	Input Dim	Output Level (%)	Perceived Output (%)
0	0.00	0.0	22.4	2.77	22.4	44.9	7.82	44.9
0.4	1.00	0.4	22.8	2.82	22.8	45.3	7.96	45.3
0.8	1.02	0.8	23.2	2.87	23.2	45.7	8.11	45.7
1.2	1.04	1.2	23.6	2.93	23.6	46.1	8.26	46.1
1.6	1.06	1.6	24.0	2.98	24.0	46.5	8.41	46.5
2.0	1.08	2.0	24.4	3.04	24.4	46.9	8.57	46.9
2.4	1.10	2.4	24.8	3.09	24.8	47.2	8.72	47.2
2.8	1.12	2.8	25.2	3.15	25.2	47.6	8.88	47.6
3.1	1.14	3.1	25.6	3.21	25.6	48.0	9.05	48.0
3.5	1.16	3.5	26.0	3.26	26.0	48.4	9.21	48.4
3.9	1.18	3.9	26.4	3.32	26.4	48.8	9.38	48.8
4.3	1.20	4.3	26.8	3.39	26.8	49.2	9.56	49.2
4.7	1.22	4.7	27.2	3.45	27.2	49.6	9.73	49.6
5.1	1.24	5.1	27.6	3.51	27.6	50.0	9.91	50.0
5.5	1.27	5.5	28.0	3.58	28.0	50.4	10.09	50.4
5.9	1.29	5.9	28.3	3.64	28.3	50.8	10.28	50.8
6.3	1.31	6.3	28.7	3.71	28.7	51.2	10.47	51.2
6.7	1.34	6.7	29.1	3.78	29.1	51.6	10.66	51.6
7.1	1.36	7.1	29.5	3.85	29.5	52.0	10.85	52.0
7.5	1.39	7.5	29.9	3.92	29.9	52.4	11.05	52.4
7.9	1.41	7.9	30.3	3.99	30.3	52.8	11.26	52.8
8.3	1.44	8.3	30.7	4.06	30.7	53.1	11.46	53.1
8.7	1.47	8.7	31.1	4.14	31.1	53.5	11.67	53.5
9.1	1.49	9.1	31.5	4.21	31.5	53.9	11.89	53.9
9.4	1.52	9.4	31.9	4.29	31.9	54.3	12.11	54.3
9.8	1.55	9.8	32.3	4.37	32.3	54.7	12.33	54.7
10.2	1.58	10.2	32.7	4.45	32.7	55.1	12.55	55.1
10.6	1.61	10.6	33.1	4.53	33.1	55.5	12.79	55.5
11.0	1.63	11.0	33.5	4.61	33.5	55.9	13.02	55.9
11.4	1.66	11.4	33.9	4.70	33.9	56.3	13.26	56.3
11.8	1.70	11.8	34.3	4.78	34.3	56.7	13.50	56.7
12.2	1.73	12.2	34.6	4.87	34.6	57.1	13.75	57.1
12.6	1.76	12.6	35.0	4.96	35.0	57.5	14.00	57.5
13.0	1.79	13.0	35.4	5.05	35.4	57.9	14.26	57.9
13.4	1.82	13.4	35.8	5.15	35.8	58.3	14.52	58.3
13.8	1.86	13.8	36.2	5.24	36.2	58.7	14.79	58.7
14.2	1.89	14.2	36.6	5.34	36.6	59.1	15.06	59.1
14.6	1.93	14.6	37.0	5.43	37.0	59.4	15.34	59.4
15.0	1.96	15.0	37.4	5.53	37.4	59.8	15.62	59.8
15.4	2.00	15.4	37.8	5.64	37.8	60.2	15.91	60.2
15.7	2.03	15.7	38.2	5.74	38.2	60.6	16.20	60.6
16.1	2.07	16.1	38.6	5.85	38.6	61.0	16.50	61.0
16.5	2.11	16.5	39.0	5.95	39.0	61.4	16.80	61.4
16.9	2.15	16.9	39.4	6.06	39.4	61.8	17.11	61.8
17.3	2.19	17.3	39.8	6.17	39.8	62.2	17.42	62.2
17.7	2.23	17.7	40.2	6.29	40.2	62.6	17.74	62.6
18.1	2.27	18.1	40.6	6.40	40.6	63.0	18.07	63.0
18.5	2.31	18.5	40.9	6.52	40.9	63.4	18.40	63.4
18.9	2.35	18.9	41.3	6.64	41.3	63.8	18.74	63.8
19.3	2.40	19.3	41.7	6.76	41.7	64.2	19.08	64.2
19.7	2.44	19.7	42.1	6.89	42.1	64.6	19.43	64.6
20.1	2.48	20.1	42.5	7.01	42.5	65.0	19.79	65.0
20.5	2.53	20.5	42.9	7.14	42.9	65.4	20.15	65.4
20.9	2.58	20.9	43.3	7.27	43.3	65.7	20.52	65.7
21.3	2.62	21.3	43.7	7.41	43.7	66.1	20.90	66.1
21.7	2.67	21.7	44.1	7.54	44.1	66.5	21.28	66.5
22.0	2.72	22.0	44.5	7.68	44.5	66.9	21.68	66.9

APPENDIX G: CASAMBI CONTROL PROTOCOL DIMMING OUTPUT CONTINUED

Input Dim	Output Level (%)	Perceived Output (%)	Input Dim	Output Level (%)	Perceived Output (%)	Input Dim	Output Level (%)	Perceived Output (%)
67.3	22.07	67.3	78.7	37.42	78.7	90.2	63.44	90.2
67.7	22.48	67.7	79.1	38.11	79.1	90.6	64.61	90.6
68.1	22.89	68.1	79.5	38.81	79.5	90.9	65.79	90.9
68.5	23.31	68.5	79.9	39.52	79.9	91.3	67.00	91.3
68.9	23.74	68.9	80.3	40.25	80.3	91.7	68.23	91.7
69.3	24.18	69.3	80.7	40.99	80.7	92.1	69.49	92.1
69.7	24.62	69.7	81.1	41.74	81.1	92.5	70.76	92.5
70.1	25.07	70.1	81.5	42.51	81.5	92.9	72.06	92.9
70.5	25.53	70.5	81.9	43.29	81.9	93.3	73.39	93.3
70.9	26.00	70.9	82.3	44.08	82.3	93.7	74.73	93.7
71.3	26.48	71.3	82.7	44.89	82.7	94.1	76.11	94.1
71.7	26.97	71.7	83.1	45.72	83.1	94.5	77.50	94.5
72.0	27.46	72.0	83.5	46.56	83.5	94.9	78.93	94.9
72.4	27.97	72.4	83.9	47.41	83.9	95.3	80.38	95.3
72.8	28.48	72.8	84.3	48.28	84.3	95.7	81.85	95.7
73.2	29.00	73.2	84.6	49.17	84.6	96.1	83.36	96.1
73.6	29.54	73.6	85.0	50.07	85.0	96.5	84.89	96.5
74.0	30.08	74.0	85.4	50.99	85.4	96.9	86.45	96.9
74.4	30.63	74.4	85.8	51.93	85.8	97.2	88.04	97.2
74.8	31.19	74.8	86.2	52.88	86.2	97.6	89.65	97.6
75.2	31.77	75.2	86.6	53.85	86.6	98.0	91.30	98.0
75.6	32.35	75.6	87.0	54.84	87.0	98.4	92.98	98.4
76.0	32.94	76.0	87.4	55.85	87.4	98.8	94.69	98.8
76.4	33.55	76.4	87.8	56.88	87.8	99.2	96.43	99.2
76.8	34.17	76.8	88.2	57.92	88.2	99.6	98.20	99.6
77.2	34.79	77.2	88.6	58.99	88.6	100.0	100.00	100.0
77.6	35.43	77.6	89.0	60.07	89.0			
78.0	36.08	78.0	89.4	61.17	89.4			
78.3	36.75	78.3	89.8	62.30	89.8			

Dimming Response

Perceived Dimming Response
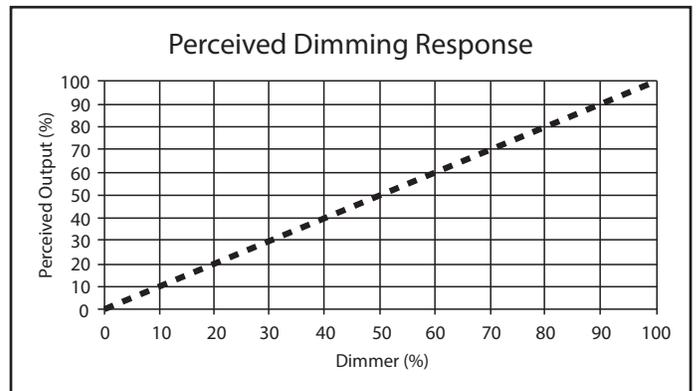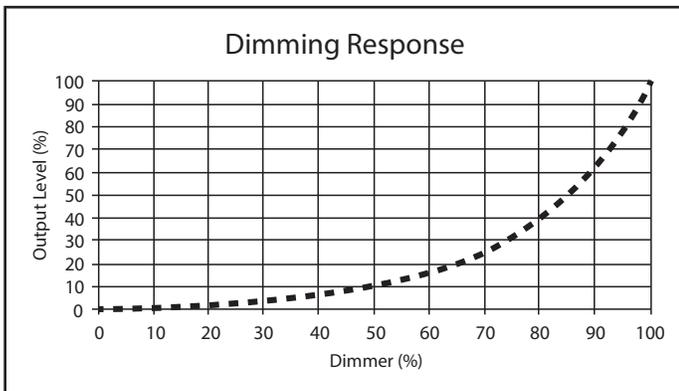
APPENDIX G: CASAMBI CONTROL PROTOCOL CCT OUTPUT

Input CCT (K)	Output CCT (K)	Input CCT (K)	Output CCT (K)	Input CCT (K)	Output CCT (K)	Input CCT	Output CCT (K)	Input CCT (K)	Output CCT (K)	Input CCT (K)	Output CCT (K)	Input CCT (K)	Output CCT (K)
2700	2700	3270	3270	3840	3840	4410	4410	4810	4810	5210	5210	5610	5610
2710	2710	3280	3280	3850	3850	4420	4420	4820	4820	5220	5220	5620	5620
2720	2720	3290	3290	3860	3860	4430	4430	4830	4830	5230	5230	5630	5630
2730	2730	3300	3300	3870	3870	4440	4440	4840	4840	5240	5240	5640	5640
2740	2740	3310	3310	3880	3880	4450	4450	4850	4850	5250	5250	5650	5650
2750	2750	3320	3320	3890	3890	4460	4460	4860	4860	5260	5260	5660	5660
2760	2760	3330	3330	3900	3900	4470	4470	4870	4870	5270	5270	5670	5670
2770	2770	3340	3340	3910	3910	4480	4480	4880	4880	5280	5280	5680	5680
2780	2780	3350	3350	3920	3920	4490	4490	4890	4890	5290	5290	5690	5690
2790	2790	3360	3360	3930	3930	4500	4500	4900	4900	5300	5300	5700	5700
2800	2800	3370	3370	3940	3940	4510	4510	4910	4910	5310	5310		
2810	2810	3380	3380	3950	3950	4520	4520	4920	4920	5320	5320		
2820	2820	3390	3390	3960	3960	4530	4530	4930	4930	5330	5330		
2830	2830	3400	3400	3970	3970	4540	4540	4940	4940	5340	5340		
2840	2840	3410	3410	3980	3980	4550	4550	4950	4950	5350	5350		
2850	2850	3420	3420	3990	3990	4560	4560	4960	4960	5360	5360		
2860	2860	3430	3430	4000	4000	4570	4570	4970	4970	5370	5370		
2870	2870	3440	3440	4010	4010	4580	4580	4980	4980	5380	5380		
2880	2880	3450	3450	4020	4020	4590	4590	4990	4990	5390	5390		
2890	2890	3460	3460	4030	4030	4600	4600	5000	5000	5400	5400		
2900	2900	3470	3470	4040	4040	4610	4610	5010	5010	5410	5410		
2910	2910	3480	3480	4050	4050	4620	4620	5020	5020	5420	5420		
2920	2920	3490	3490	4060	4060	4630	4630	5030	5030	5430	5430		
2930	2930	3500	3500	4070	4070	4640	4640	5040	5040	5440	5440		
2940	2940	3510	3510	4080	4080	4650	4650	5050	5050	5450	5450		
2950	2950	3520	3520	4090	4090	4660	4660	5060	5060	5460	5460		
2960	2960	3530	3530	4100	4100	4670	4670	5070	5070	5470	5470		
2970	2970	3540	3540	4110	4110	4680	4680	5080	5080	5480	5480		
2980	2980	3550	3550	4120	4120	4690	4690	5090	5090	5490	5490		
2990	2990	3560	3560	4130	4130	4700	4700	5100	5100	5500	5500		
3000	3000	3570	3570	4140	4140	4710	4710	5110	5110	5510	5510		
3010	3010	3580	3580	4150	4150	4720	4720	5120	5120	5520	5520		
3020	3020	3590	3590	4160	4160	4730	4730	5130	5130	5530	5530		
3030	3030	3600	3600	4170	4170	4740	4740	5140	5140	5540	5540		
3040	3040	3610	3610	4180	4180	4750	4750	5150	5150	5550	5550		
3050	3050	3620	3620	4190	4190	4760	4760	5160	5160	5560	5560		
3060	3060	3630	3630	4200	4200	4770	4770	5170	5170	5570	5570		
3070	3070	3640	3640	4210	4210	4780	4780	5180	5180	5580	5580		
3080	3080	3650	3650	4220	4220	4790	4790	5190	5190	5590	5590		
3090	3090	3660	3660	4230	4230	4800	4800	5200	5200	5600	5600		
3100	3100	3670	3670	4240	4240								
3110	3110	3680	3680	4250	4250								
3120	3120	3690	3690	4260	4260								
3130	3130	3700	3700	4270	4270								
3140	3140	3710	3710	4280	4280								
3150	3150	3720	3720	4290	4290								
3160	3160	3730	3730	4300	4300								
3170	3170	3740	3740	4310	4310								
3180	3180	3750	3750	4320	4320								
3190	3190	3760	3760	4330	4330								
3200	3200	3770	3770	4340	4340								
3210	3210	3780	3780	4350	4350								
3220	3220	3790	3790	4360	4360								
3230	3230	3800	3800	4370	4370								
3240	3240	3810	3810	4380	4380								
3250	3250	3820	3820	4390	4390								
3260	3260	3830	3830	4400	4400								

Color Temperature Response
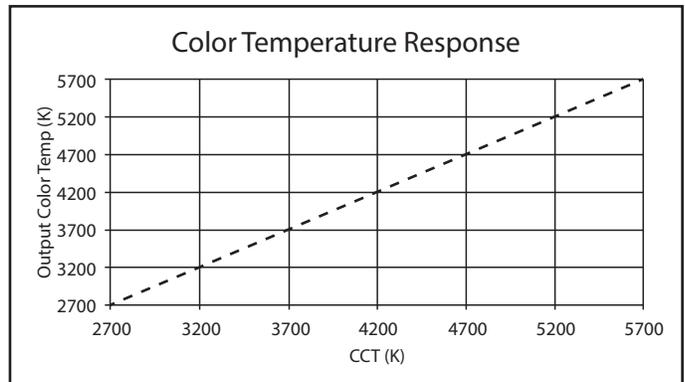
13.0 PRODUCT SUPPORT

Contact Cooledge Technical Support at:

      E: apps.engineering@cooledgelighting.com
      O: +1.781.899.0317
      T: +1.844.455.4448 (toll free - North America)

14.0 WARRANTY

Cooledge warrants that the products manufactured, distributed or sold by it will:

1.	Be free of any claim of ownership by third parties
2.	Be conforming to the Specifications and free from defects in materials and workmanship under normal use, handling, warehousing and service.

The warranty period specified in the Cooledge Warranty Terms and Conditions for the products will be for a period of five (5) years from the shipment date of any products sold by Cooledge.

CE   c(UL)us LISTED   RoHS   (5) 5 YEAR SYSTEM WARRANTY   **5 Year Limited Warranty:** Parts and workmanship