

araya⁵[®]

TUNABLE COLOR

araya⁵ Color Tuning LED Modules
CTM 0TD (2000 Maximum Peak Lumens)
CTM 0ND (1800 Maximum Peak Lumens)
Data Sheet

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1 DESCRIPTION AND ORDERING INFORMATION



Description

araya⁵ Color Tuning Modules mix five colors of LEDs to deliver tunable and dimmable white light at 90+ CRI and color consistency of <2 MacAdam ellipse across tuning ranges of 1650 - 4000K or 2700 - 6000K. Delivered light can be dimmed from 100 - 1% in increments of 1% at constant CCT. Gradients of saturated colors from 1 - 100% can be added to color points within the tuning range. araya⁵ modules integrate the driver electronics for precise control of current and PWM inputs and LED light output while tuning and dimming. On board closed loop thermal feedback compensates each color channel for thermally induced variations in optical output due to tuning, dimming or ambient temperatures. On board closed loop optical feedback measures the lumen depreciation of each channel and re-balances the color model to ensure color consistency over the 50,000 hour life of the module. An in-line manufacturing process captures the spectral characteristics of each LED under multiple conditions, generating a unique color model for each color tuning module. araya⁵ Color Tuning Modules are compatible with traditional 0 - 10V wired controls, and digital protocols including Lutron[®] EcoSystem and DMX / Bluetooth using the optional Lumenetix Digital Control Adapter. For simple deployment, SceneSet[®] allows up to five scenes to be pre-programmed into the module during production and recalled at the venue using a 0 - 10V controller. Commissioning of the module and the re-programming of SceneSet[®] is done via the wireless Lumenetix Light Commissioning Tool that connects to the embedded radio. The CTM Zero series features light emitting surfaces (LES) of 22 mm and 32 mm, and tuning ranges of 1650 - 4000K and 2700 - 6000K.

Key Features

- Two tunable ranges: 1650 - 4000K and 2700 - 6000K
- Dimmable from 100 - 1% at constant CCT
- Color gamut control: gradients of saturated colors from 1 - 100% can be added to color points
- Integrated driver electronics
- On board thermal & optical feedback for color consistency of <2 MacAdam ellipse over 50,000 hour life
- On board thermal turndown
- In-line spectral capture creates unique color model for each module
- Compatible with 0 - 10V wired controls
- Lutron EcoSystem, DMX / Bluetooth compatibility via the optional Digital Control Adapter
- Copy and Paste for exact fixture to fixture matching
- SceneSet enables up to five scenes to be preprogrammed and recalled using a 0 - 10V controller
- Commissioning via wireless Light Commissioning Tool
- Two light emitting surfaces: 22mm and 32mm
- Front heat sink mounting
- Provisions for reflector mounting



Light Commissioning Tool

Photometrics and Ordering Codes

Tunable Color Ranges: 1650 - 4000K 2700 - 6000K		Wattage	Peak Lumens / Ordering Codes			
			Peak Lumens	Ordering Code	Peak Lumens	Ordering Code
Specifications*	CTM 0TD	32W	1800	45.011.003.01	2000	45.011.004.01
	CTM 0ND	32W	1600	45.011.001.01	1800	45.011.002.01
	CTM 0TD	25W	1500	45.011.008.01	1575	45.010.018.01
	CTM 0ND	25W	1400	45.011.007.01	1450	45.010.016.01
	CTM 0TD	20W	1300	45.010.023.01	1350	45.011.009.01
	CTM 0ND	20W	1200	45.010.020.01	1250	45.010.015.01
CRI (Ra) Across Tuning Range		>90				
Dimming		100% to 1% in increments of 1% at constant CCT				
Nominal Color Consistency		<2 MacAdam ellipse (± 0.002 Duv from C78.377-2008 ANSI curve)				
Color Consistency Over Life		Calibration maintains original color points over life				
Lumen Maintenance		L70 (70% of initial lumens) at 50,000 hours				

* Lumen and wattage range is within +/- 10% of the nominal value. Peak efficacy is not necessarily at typical peak lumens.

2 ELECTRICAL AND MECHANICAL SPECIFICATIONS

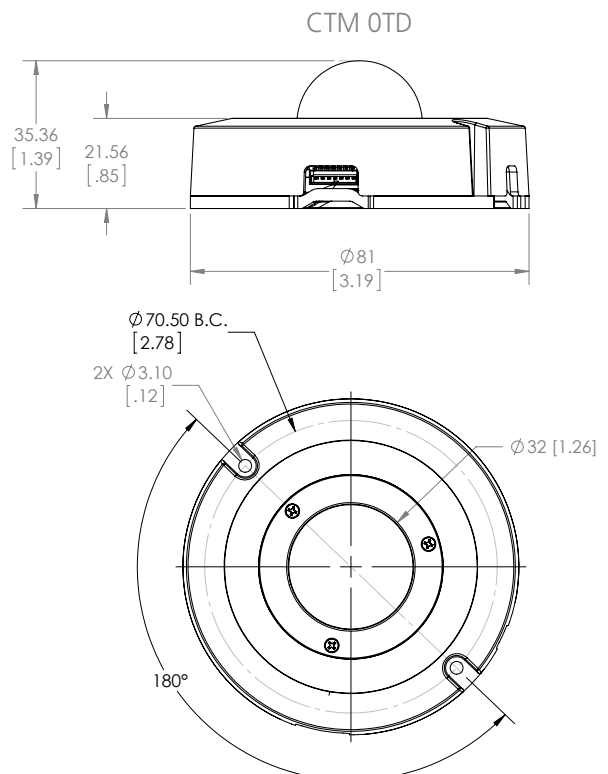
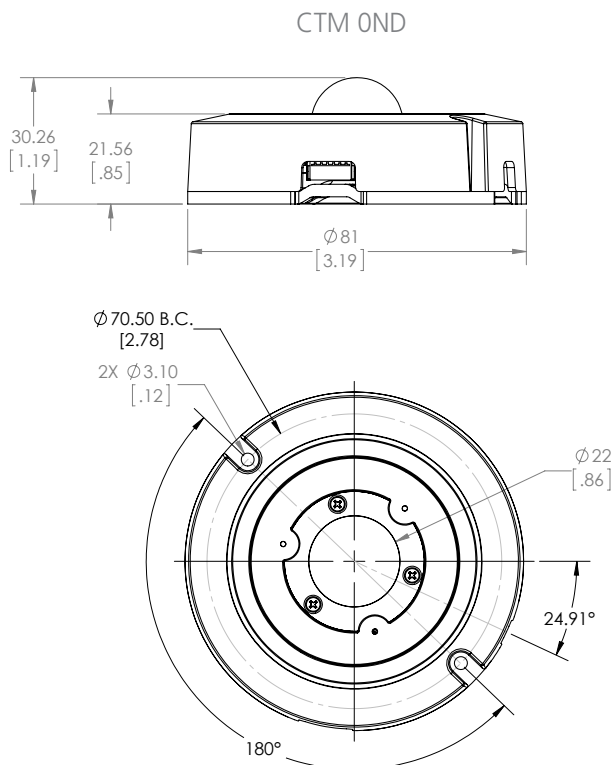
Electrical Specifications

Input Voltage	24V DC
Nominal Power Input	32W, 25W, 20W
Nominal Current Input	32W: 1.33A; 25W: 1.04A; 20W: 0.83A
Power Supply Classification	Class 2
Power Connector	Molex 874380243 (requires Molex 874390200)
Control Connector	Molex 874370543 (requires Molex 874390700)
Control Options ¹	0 - 10V, Lutron [®] EcoSystem, DMX / Bluetooth
CCT and Dimming Control Connections	Connector harness, 24 gauge leads

1. Lutron EcoSystem, DMX / Bluetooth require optional Digital Control Adapter.

Mechanical Specifications

Dimensions	Diameter:	3.19 inches (81 mm)
	Height:	CTM 0ND: 1.19 inches (30.26 mm); CTM 0TD: 1.39 inches (35.36 mm)
Light Emitting Surface	22 and 32 mm	
Weight	0.25 pounds (0.11 kg)	
Heat Sink Attachment	Front mount, M2.5 or 4-40 Screws	
Max Case Temperature	≤70°C	



3 HEAT SINKING RECOMMENDATIONS

The Color Tuning Module requires an external heat sink in order to ensure proper operating temperature of the LEDs. The CTM has a conductive aluminum case and an efficient thermal path to the LED array. These features promote efficient thermal management and allow for a simple heat sink design in most applications.

Examples of heat sinking methods are cast or extruded heat sinks. Both carbon and stainless steel are much less efficient at transferring heat than aluminum and therefore are not recommended as heat sink materials. The heat sink mounting surface should be flat and smooth. Metal-to-metal contact surfaces will result in best performance; anodized or unfinished mounting surfaces are recommended. Mounting the CTM on a painted aluminum surface will reduce the performance of the heat sink material.

3.1 Compatible Heat Sinks

The following tables list heat sinks models that have compatible form factors and thermal resistance characteristics for use with the CTM. The thermal resistances assume an approximate ambient temperature of 25°C. The heat sinks listed here are suggestions only.

MechaTronix (round)

Part Number	Dia. (mm)	Height (mm)	Thermal Resistance (°C/W)
LSB9950	99	50	1.3 – 1.5
LSB9980	99	80	1.2 – 1.4
Nano 7080	70	80	1.8
Micro 8630	86	30	1.8
Micro 8650	86	50	1.5
Micro 8680	86	80	1.2

IMPORTANT: These heat sinks are qualified in “free air”. If the CTM is installed in an insulated can fixture (IC Can), the module may exceed the recommended operating temperature. The heat sink must be evaluated and temperature tested in the fixture at applicable ambient temperatures for the desired application.
Additional product information at www.led-heatsink.com

Aavid Thermalloy Heat Sink Extrusions (square/rectangular)

Part Number	Width (mm)	Length	Height (mm)	Thermal Resistance (°C/W)
67590	88	88	31	1.5 – 1.7
61085	136	85	33	1.4 – 1.6

Additional product information at www.aavid.com

4 POWER SUPPLY REQUIREMENTS

4.1 Electrical Specifications

Description and Nominal Power Input	CTM 0ND / CTM 0TD, 32W	CTM 0ND / CTM 0TD, 25W	CTM 0ND / CTM 0TD, 20W
Input Voltage	24V DC	24V DC	24V DC
Nominal Current Input	32W: 1.33A	25W: 1.04A	20W: 1.20A
Power Supply Classification	Class 2	Class 2	Class 2

IMPORTANT

The Color Tuning Module has on-board drive electronics, including dimming. A dimming driver should NOT be used.

4.2 Recommended Power Supplies (Constant Voltage)

Manufacturer	Part Number	Rated Power	Input Voltage	Number of 20W Modules Tested	Number of 25W Modules Tested	Number of 32W Modules Tested
Mean Well	IRM-30-24ST	30W	90V - 264V	1	1	0
LTF	DA35W24VBF-000	35W	120V	1	0	0
Mean Well	LPV-35-24	35W	90V - 264V	1	1	1
LTF	DA40W24VOCND-0000	40W	120V	1	1	0
Thomas Research	LED40W-24	40W	120V - 277V	1	1	0
Inventronics	EUV-042S024PS	42W	120V - 277V	1	1	1
Mean Well	IRM-45-24ST	45W	90V - 264V	1	1	1
Aceleds	AC-A50V24H2.1C	50W	120V - 277V	1	1	1
Excelsys Technologies	LXV50-024SW	50W	120V - 277V	1	1	1
Inventronics	EUV-050S024ST	50W	120V - 277V	1	1	1
Thomas Research	LED50W-24	50W	120V - 277V	1	1	1
Mean Well	IRM-60-24ST	60W	90V - 264V	2	1	1
Mean Well	LPV-60-24	60W	90V - 264V	2	1	1
Mean Well	SGA60U24	60W	90V - 264V	2	1	1
Philips Advance	LEDINTA0024V28F0	67W	120V - 277V	1	1	1
Excelsys Technologies	LXV75-024SW	75W	120V - 277V	2	2	1
Thomas Research	PLED75W-024	75W	120V - 277V	2	2	1
Osram	OT96W/24/UNV	96W	120V - 277V	1	1	1
Excelsys Technologies	LXV100-024SW	100W	120V - 277V	2	2	2
Mean Well	LPV-100-24	100W	90V - 264V	2	2	2
Philips Advance	LEDINTA0024V4IF0	100W	120V - 277V	1	1	1

CAUTION:

- Using a constant current power supply will damage the module, and will void the Lumenetix warranty.
- Using a triac or dimming driver will damage the module, and will void the Lumenetix warranty.
- If a recommended power supply from the above list is not used, it will void the Lumenetix warranty.
- The power supply MUST be evaluated with the module(s) that it will be operated with.

NOTES:

- Recommendations are subject to change. Consult your Lumenetix representative for the most updated list.
- Power supply qualification process: if a power supply that is not part of the above list is submitted for testing to Lumenetix (during the design-in phase), it will be qualified or disqualified within two weeks of submission.

5 CASE TEMPERATURE MEASUREMENT POINTS

The thermal management characteristics of the heat sink used with the CTM should be validated by measuring its case temperature. This test should be done with the CTM installed in the fixture at ambient temperature and air flow conditions similar to the end-use installation.

araya⁵ CTM 0ND or CTM 0TD are available with two CCT ranges: 1650 – 4000K and 2700 – 6000K. Depending on the CCT range, the case temperature should be measured at the following CCT setting.

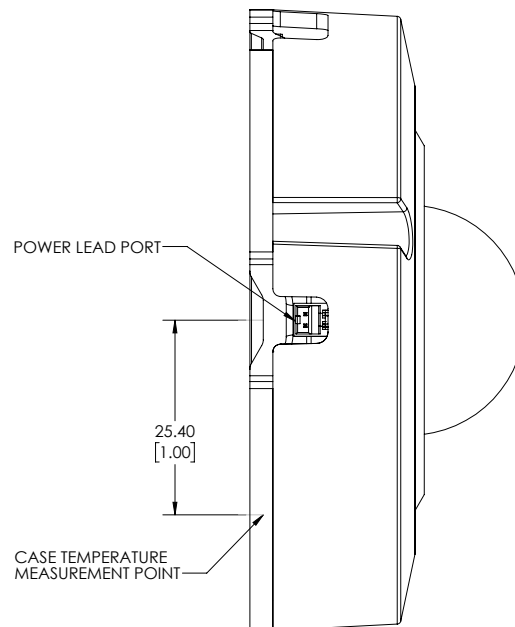
CCT Setting for Case Temperature (T_c) Measurement

CCT range	CCT Setting to Measure T_c
1650 – 4000K	2800K
2700 – 6000K	4400K

The proper case temperature measurement location is on the narrow metal band, next to the power lead port; see figure below. The case temperature reading should be made after the unit has reached steady state, where the case temperature levels out. It is recommended to design the thermal management system for a case temperature of 70°C.

Maximum case temperature: 70°C

The Color Tuning Module has on-board thermal protection to reduce the current to the LEDs when the maximum case temperature is exceeded. This prevents unacceptably high LED junction temperatures by slightly dimming the module.



Case Temperature Measurement Point

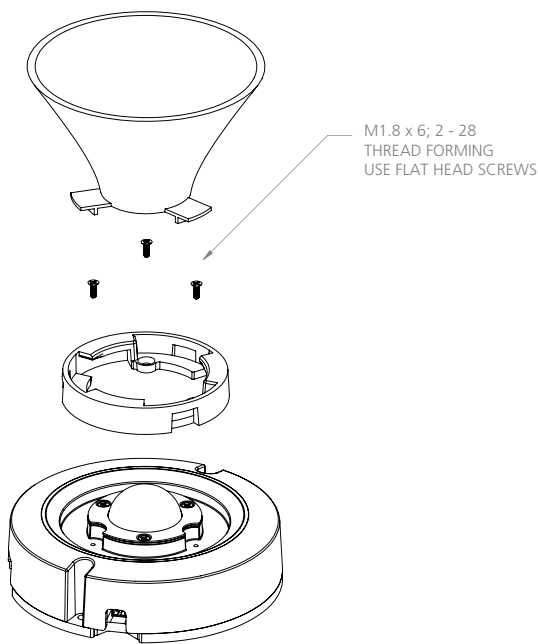
6 SECONDARY OPTICS

6.1 Attaching Compatible CTM 0ND Reflectors

The CTM 0ND accepts twist-to-lock reflectors with an attachment collar. The fastener specifications are shown in the following table while mounting hole locations are shown in the figure below.

CTM 0ND Secondary Optics Fastener Specifications

CTM 0ND Reflector	Fastener specifications	Screw length	Notes
Twist Lock w/ Collar	2 - 28; M1.8 x 6	6 mm (1/4")	Thread forming; use flat head screws



CTM 0ND Twist-Lock Style Reflectors with attachment collars

6 SECONDARY OPTICS

6.2 Compatible Reflectors

Compatible Reflectors for CTM 0ND (1650K-4000K):

Manufacturer	M. Part Number	beam angle (deg)	outer dim (mm)	height (mm)	optical finish	optical finish 2	attach method
Widgerm	2070T-XC	50	70	44	specular	none	twist lock
Widgerm	3207T-XC	38	82	46	diffuse	none	twist lock
Widgerm	4201T-XM	13	111	69	specular	faceted, square	twist lock
Widgerm	1009T-XC	38	49	30.5	specular	faceted	twist lock
Diffraction Optics	P6762	40	50	29	specular	none	twist lock
Diffraction Optics	P7076	20	94.4	83	specular	faceted	twist lock
Diffraction Optics	P7899	40	49.3	28.6	specular	faceted	twist lock
Diffraction Optics	P6764	56	50	29	specular	none	twist lock
Diffraction Optics	P6643	20	70	42	specular	none	twist lock
Diffraction Optics	P4769	40	54.1	42.3	specular	none	twist lock
khatod	1682 CR	11	65	35	specular	none	TE Type 2 clip/ TBD*
khatod	1682 ST	20	65	35	diffuse	none	TE Type 2 clip/ TBD*
khatod	1685 ST	32	65	35	diffuse	none	TE Type 2 clip/ TBD*
khatod	1688 CR	38	65	35	specular	none	TE Type 2 clip/ TBD*
khatod	1688 ST	38	65	35	diffuse	none	TE Type 2 clip/ TBD*
khatod	1690 ST	50	65	35	diffuse	none	TE Type 2 clip/ TBD*
Nata	4-1406-E	20.3	110	66.2	specular	faceted^2	none
Nata	3990E	23.2	75	43	specular	faceted^2	none
Nata	3991E	35.7	75	43	specular	faceted^2	none
Nata	3992E	24.8	85	50.5	specular	faceted^2	none
Nata	3993E	40	85	50.5	specular	faceted^2	none
Top Lighting	XSA-13	22	70	43	specular	none	none
Top Lighting	XSA-14	46	70	43	specular	none	none
Top Lighting	XSA-15	60	70	43	specular	none	none

* Requires custom adapter ring for mounting (not included). Please consult factory for details.

Compatible Reflectors for CTM 0ND (2700K-6000K):

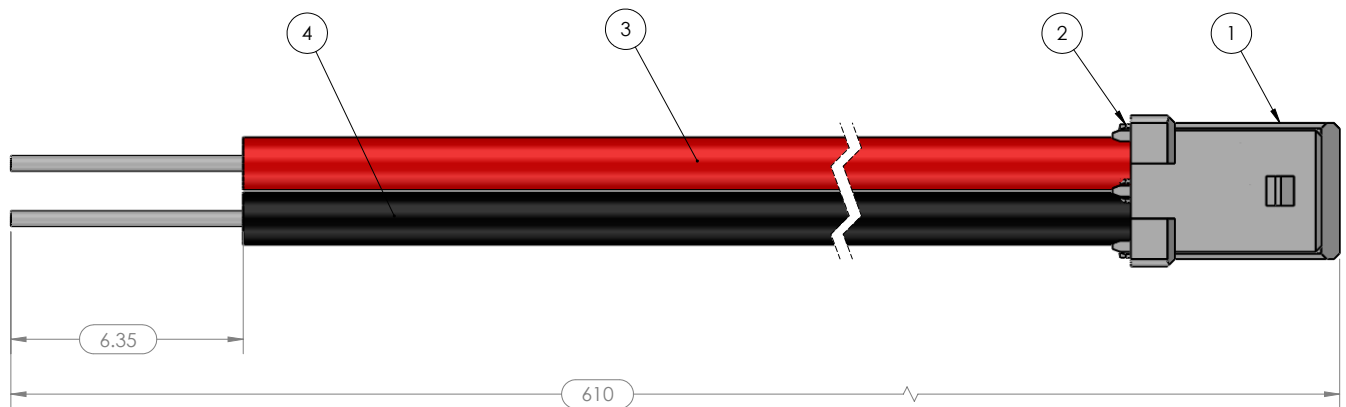
Manufacturer	M. Part Number	beam angle (deg)	outer dim (mm)	height (mm)	optical finish	optical finish 2	attach method
Khatod	1682 ST	20	65	35	diffuse	none	TE Type 2 clip
Khatod	1683 ST	24	65	35	diffuse	none	TE Type 2 clip
Khatod	1687 ST	31	65	35	diffuse	none	TE Type 2 clip
Khatod	1688 ST	38	65	35	diffuse	none	TE Type 2 clip
Khatod	1691 ST	56	65	35	diffuse	none	TE Type 2 clip

NOTE: Reflectors have been recommended based on independent optical tests conducted by Lumenetix, and should be used as guidelines.
Final reflector evaluation should be made by fixture manufacturers with all optics in place.

7 POWER / CONTROL CABLE ASSEMBLIES

7.1 Power Cable Assembly

Provides power to each module.
Lumenetix part #: 28.002.001.01



Note: All dimensions are in millimeters.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	874390200	MOLEX CONNECTOR	1
2	874210000	CRIMP	2
3	A2015R-100-ND	24 AWG WIRE, RED	1
4	A2015B-100-ND	24 AWG WIRE, BLACK	1

7.1.2 Pin Allocation Chart for Power Cable Assembly

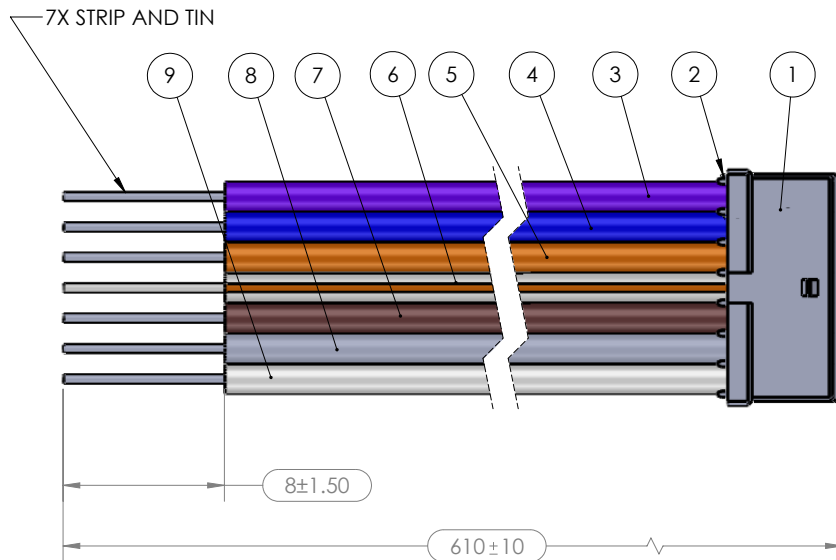
Pin #	Lead Color	Input
Pin 1	Red	Power 24V DC
Pin 2	Black	Power Common

7 POWER / CONTROL CABLE ASSEMBLIES

7.2 Control Cable Assembly

Provides 0-10V control and RS-485 signals to each module.

Lumenetix part #: 28.002.002.01



Note: All dimensions are in millimeters.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	874390700	MOLEX CONNECTOR	1
2	874210000	CRIMP	7
3	VIOLET WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG VIOLET	1
4	BLUE WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG BLUE	1
5	ORANGE WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG ORANGE	1
6	WHITE WITH ORANGE STRIPE WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG WHITE WITH ORANGE STRIPE	1
7	BROWN WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG BROWN	1
8	GREY WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG GREY	1
9	WHITE WIRE 24AWG	HOOK-UP WIRE STRANDED 7/32 24AWG WHITE	1

7.2.2 Pin Allocation Chart for Control Cable Assembly

Pin #	Lead Color	Input
Pin 1	Violet	0-10V Dimming (+)
Pin 2	Blue	0-10V Color (+)
Pin 3	Orange	Data (-)
Pin 4	White with Orange Stripe	Data (+)
Pin 5	Brown	Digital Common
Pin 6	Gray	Signal Common for 0-10V Dimming (-)
Pin 7	White	Signal Common for 0-10V Color (-)

8 WIRING DIAGRAMS

8.1 0-10V Best Wiring Practice

Best practice is to limit the distance run for the analog control wiring from the controller to the last driver to 300'. This is based on 18 AWG wire. It is possible to extend the run to 400' by using 16 AWG wire, but that should be considered carefully as an exception to best design practice.

Whenever any part of the control circuit (the driver, dimer, or wire used) is designed for use in a Class 2 installation, it is critical that the entire control circuit be kept separate from Class 1 line voltage wiring per the requirement of National Electric Code, section 725.136. The electrical drawings must be very clear that class 1 and class 2 wiring cannot be combined. There must be separation because: a) it is possible for higher voltage wiring to induce an AC voltage in to the low voltage signal wiring; and, b) undesirable visual artifacts in the dimmed lighting can be caused when the line and low voltage wiring is run together (especially for long distances). We do not recommend installing the low voltage signal wiring in the same conduit or raceway as line voltage wiring even when all elements of the control circuit are listed for Class 1 wiring methods.

0-10V Dimmers (recommended list)*

Crestron

ETC

Fresco

Legrand

Leviton

Lutron

Nexlight

N-Light

Pass & Seymour

Vantage

Wattstopper

*Recommendations are subject to change. Consult your Lumenetix representative for the most updated list.

8 WIRING DIAGRAMS

8.2 Lutron[®] EcoSystem Protocol

EcoSystem technology is a control method for LEDs that provides addressing of individual fixtures and status feedback. This makes it easy to digitally assign one or many fixtures without complicated wiring. This opens up an entire suite of energy-saving, system-monitoring and system-control schemes where the design, setup and rezoning are all done within software, making the electrical and control design simple.

The Digital Control Adapter complies with Lutron proprietary specifications, including misswire protection.

The adapter can be configured for one or two EcoSystem channels. "Single Channel" Ecosystem is used for DDM (Dim control only) and "Two Channel" Ecosystem is used for CTM (one channel for Dim control and one for color/CCT). The araya⁵ modules attached to different interface boards can be controlled independently or assigned to a single group by the EcoSystem controller.

The EcoSystem control is responsible for saving any configuration settings. Once an interface board is assigned a pair of addresses, assigned addresses are saved in NVRAM. During the EcoSystem discovery process, the user pairs the desired dimming control in the controller to the Dim channel address in the interface board. The same applies for the CCT channel.

- 1 pair 16AWG Eco Loop, 900 feet (**field wiring**).
- Maximum of 64 addresses on each loop.

EcoSystem Control Systems (recommended list)*

Quantum System

HomeWorks QS

Grafik Eye QS Control Unit with EcoSystem

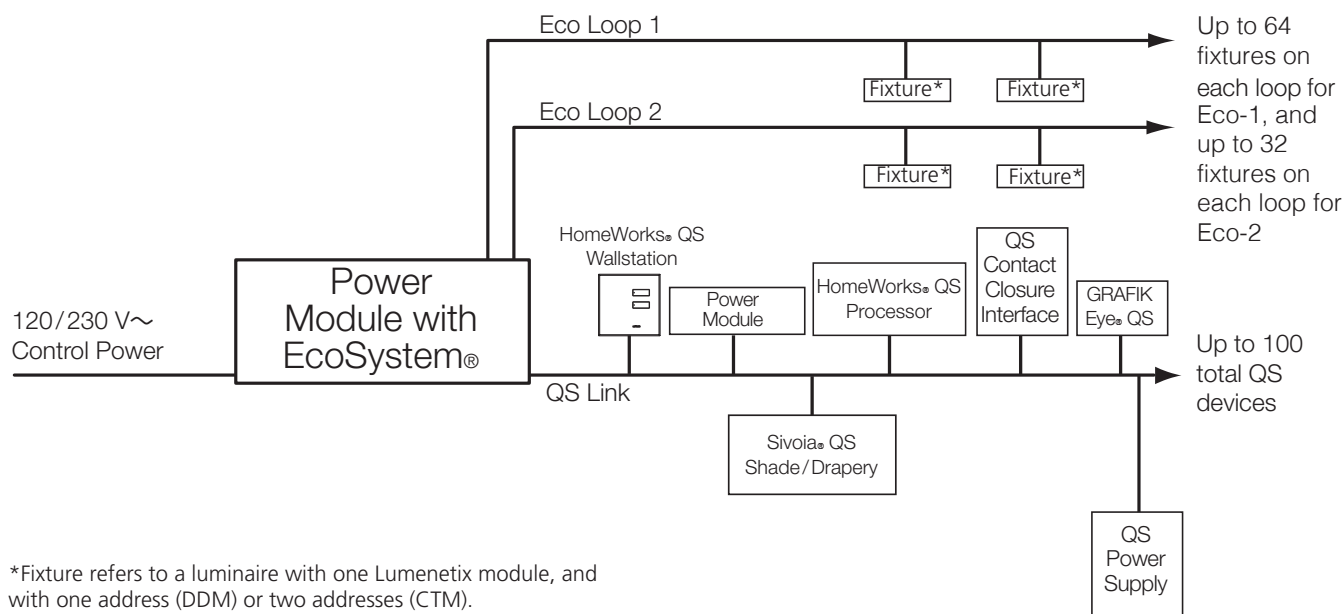
EnergiSavr Node with EcoSystem

Power Module with EcoSystem

PowPak RMJ-ECO-32-DV-B

*Recommendations are subject to change. Consult your Lumenetix representative for the most updated list.

EcoSystem Controller Example



8 WIRING DIAGRAMS

8.2.1 Lutron[®] EcoSystem Field Wiring

- EcoSystem Digital Loop can be wired as Mains voltage or IEC PELV/NECR Class 2 for maximum wiring flexibility..
- The Loop is polarity insensitive and can be wired in any topology..
- Consult all national and local electrical codes for separation requirements..

Wire Gauge	Maximum EcoSystem-Compliant Loop Wire Length
4.0 mm ² (12 AWG)	671 m (2200 ft)
2.5 mm ² (14 AWG)	427 m (1400 ft)
1.5 mm ² (16 AWG)	275 m (900 ft)
1.0 mm ² (18 AWG)	175 m (570 ft)

Drain Wire Connections

Drain wire connections are required as follows.

Shielding

To add another level of protection from electromagnetic noise, a grounded shield is added over the twisted pair wires. When this is enclosed in a protective jacket, to avoid ground loops and electromagnetic contamination of the ground system, all control ground wiring, including cable shields and drain wires, should be treated like sensitive current-carrying conductors. All control ground wires should be insulated (not bare) and the same wiring practices should be observed with ground wires as with other sensitive signals. Care must also be taken when designing control wiring to ensure that each shield is connected to only a single ground point. You should establish this point at a central location, like a control panel or cabinet, and avoid all connection to grounds in the field. A control ground is sometimes referred to as an isolated ground (an oxymoron) for this reason, but the term single-point ground is more accurate.

Method-1

A typical two-pair shielded cable can be prepared for termination to the terminals with the drain wire cut off. This is usually done at the field end of the cable where no shield grounding is desired. You will then use insulating tape or heat-shrink tubing to protect the cable from contamination and to prevent accidental grounding of the shield or drain wire. An accidental ground at this point would almost certainly create an undesirable ground loop.

Method-2

A typical two-pair shielded cable can be prepared for termination to the terminals with the drain wire cut off. The drain wire, which is an uninsulated conductor, is sleeved with a insulating tubing to prevent accidental grounding. The crimp-on lug is valuable in this instance to retain the tubing. Insulating tape or heat-shrink tubing is again used to protect the cable from contamination and to prevent accidental grounding, since any accidental connection between the drain wire and a chassis, frame, or enclosure would almost certainly create a ground loop.

8 WIRING DIAGRAMS

8.3 DMX512-A Protocol

DMX512-A is an acronym for Digital Multiplex, a communication protocol used to remotely control lighting dimmers and intelligent fixtures. It is designed to provide a common communications standard between these lighting devices regardless of the manufacturer. The 512-A after the DMX refers to the number of control channels used on one network segment (often called a 'universe') of devices. In a simple dimming system, one channel controls the intensity of the fixture. A single intelligent fixture such as the araya⁵ requires several channels to control its various parameters (one channel each for DIM, CCT, SAT, HUE).

DMX512A Specifications:

- DMX 512-A (Controller).
- A universe is 512 Channels.
- DMX value is between 0 and 255, where 0 is off and 255 is full on.
- The maximum number of devices in a daisy-chain wire run is 32, which include the controller and opto-splitter.
- The maximum network wire run is a distance of up to 1600 feet for non-RDM systems and up to 1000 feet for RDM systems.
- One device functions as the master (the DMX controller) on a network, while the rest function as slaves (mergers, splitters, intelligent fixtures, etc.).
- Only the controller (master) transmits over the network, and all fixtures receive the same data.
- The final device in the daisy-chain must be terminated with a 120 ohm resistor between DMX+ and DMX- pins.
- It is recommended that the terminator for the final device be located in the control panel, if it falls within the recommended wiring distance.
- All wiring must be in a continuous run and daisy-chained.
- Star wiring is only allowed in conjunction with an opto-splitter.
- Do not run DMX control cable in close proximity to AC power lines. EM spikes from switching of high-current devices such as HVAC equipment or generators will induce noise into the DMX cable.
- The shield must be carried through between modules and properly grounded at one point only.
- Connections to DMX512-A-RDM accessory board: wire size to be 24AWG, and solid or stranded cables may be used. Stranded wire used must be tinned or installed with ferule connector.

RDM

DMX512-A control protocol that enables Remote Device Management for two-way communications for configuration, monitoring and system setup. Allows two way communication between lighting controller and the fixtures. Allows for remote setting of DMX start addressing. RDM signals are sent back the other way, but not constantly. Controller can ask one or more devices for query feedback. RDM packets are inserted in-between the existing DMX data packets being used to control the lighting.

The DMX Control Console will broadcast up to 512 channels over one DMX cable (max. run of 1000 feet for RDM). Some of these channels may not be used, but will still be transmitted, as required by the protocol. It must be set to a desired channel (001, 002, 003, 004, etc.) to control the connected light fixture. This is usually accomplished using RDM. This desired 'channel' is commonly known as the DMX address. When addressing fixtures, it is not recommended to skip addresses.

When RDM is not available with the control system, it is permissible to use the Lumenetix commissioning tool (the araya⁵ Tunable Color 2.0 iOS App) to set the address of the slots. The instructions to configure the DMX channels can be found in the araya⁵ Tunable Color Instruction Manual.

The DMX512-A interface follows the ANSI E1.11-2008 (R21013) standard. Four address slots are allocated to each interface board and control the Dim level, CCT, Saturation and Hue of the araya⁵ modules connected to the board.

Default DMX512-A Slot Allocation:

Slot	Function
1	Dim Level
2	CCT
3	Saturation Level
4	Hue

8 WIRING DIAGRAMS

8.3.1 DMX512-A Electrical Specifications

Parameter	Range	Remarks
Receiver type	Isolated	
ESD Protection	±15KV (air), ±8KV (conducted)	Per IEC 61000-4-2
Termination	Recommended	The DMX512 bus termination rules apply
Directionality	Receive only	
Frequency stability	±20ppm	
Load per port	1/256	1/8 of Nominal RS-485
Isolation	3KV _{rms}	

Control Systems (recommended list)*

Choreo
Cognito
Crestron Greenlight System
Entec
ETC Mosaic
ETC Paradigm
Fresco
Lutron HomeWorks QS
Lutron Quantum
Nicolaudio
Pathway Connectivity
Pharos
Traxon Ecue
Vantage Controls

*Recommendations are subject to change. Consult your Lumenetix representative for the most updated list.

8 WIRING DIAGRAMS

8.3.2 DMX512-A Recommended Field Wiring

Liberty 24-2P-485 (Non-Plenum), 24 AWG, 2 pair dual 120 ohm, 11.2 pf/ft low capacitance (XLR and PHX connectors)
Liberty 24-2P-P485 (Plenum), 24 AWG, 2 pair dual 120 ohm, 11.2 pf/ft low capacitance (XLR and PHX connectors)
Belden #9842 (Non-Plenum), 24 AWG, 2 pair dual shielded 120 ohm, 12.8 pf/ft low capacitance (XLR and PHX connectors)
Belden #89842 (Plenum), 24 AWG, 2 pair dual shielded 120 ohm, 12.8 pf/ft low capacitance (XLR and PHX connectors)

Please refer to wire manufacturer's lighting catalog for and/equals as required by code.

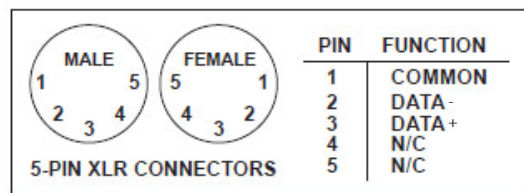
DMX512-A Recommended Field Connectors

Use only approved connectors.

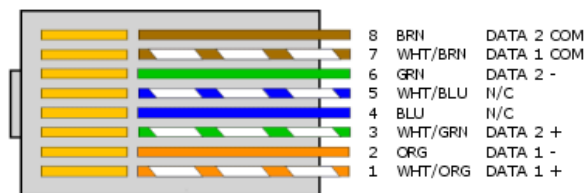
DMX512-A Wiring Connections

Signal	Description	Pin Colors (4-Pair Cable)	Pin Colors (2-Pair Cable)	3-pin XLR connector	5-Pin XLR connector
Signal Common		White/Brown and Brown	White/Blue and Blue	1	1
Data (-)	Primary Data Link	Orange	Orange	2	2
Data (+)	Primary Data Link	White/Orange	White/Orange	3	3
Data2 (-), or not used	Optional Secondary Data Link				4
Data2 (+), or not used	Optional Secondary Data Link				5

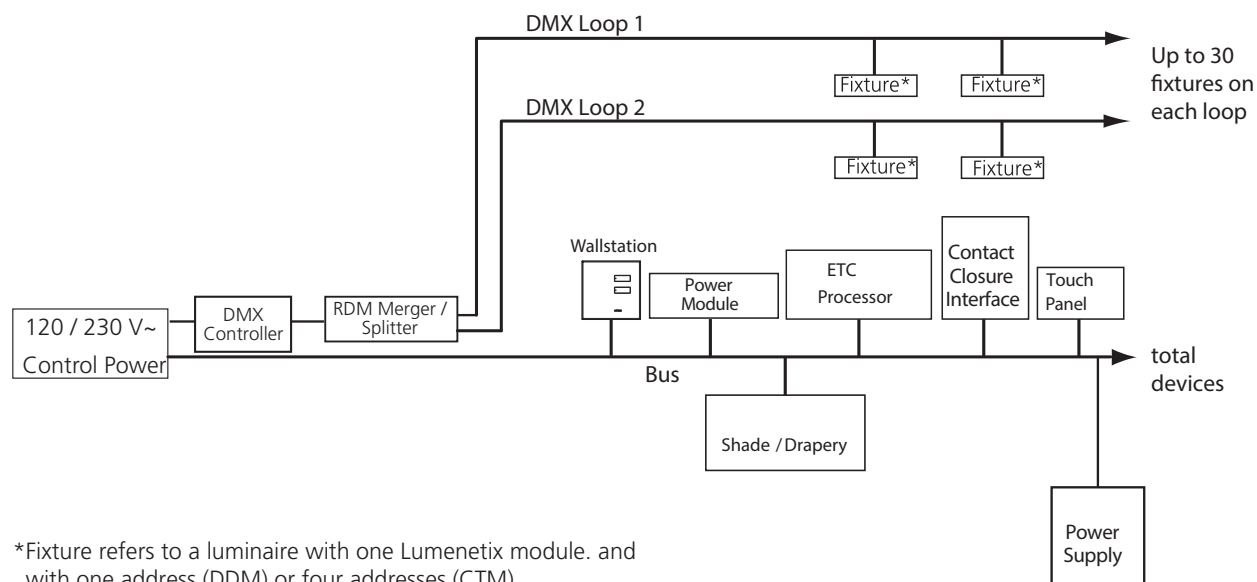
XLR Connectors (5-Pin)



RJ-45 Connector Pin-Out (T568B)



DMX512-A Controller Example



*Fixture refers to a luminaire with one Lumenetix module. and with one address (DDM) or four addresses (CTM).

8 WIRING DIAGRAMS

8.3.3 DMX512-A Drain Wire Connections

Drain wire connections are required as follows.

Shielding

To add another level of protection from electromagnetic noise, a grounded shield is added over the twisted pair wires. When this is enclosed in a protective jacket, to avoid ground loops and electromagnetic contamination of the ground system, all control ground wiring, including cable shields and drain wires, should be treated like sensitive current-carrying conductors. All control ground wires should be insulated (not bare) and the same wiring practices should be observed with ground wires as with other sensitive signals. Care must also be taken when designing control wiring to ensure that each shield is connected to only a single ground point. You should establish this point at a central location, like a control panel or cabinet, and avoid all connection to grounds in the field. A control ground is sometimes referred to as an isolated ground (an oxymoron) for this reason, but the term single-point ground is more accurate.

Method-1

A typical two-pair shielded cable can be prepared for termination to the terminals with the drain wire cut off. This is usually done at the field end of the cable where no shield grounding is desired. You will then use insulating tape or heat-shrink tubing to protect the cable from contamination and to prevent accidental grounding of the shield or drain wire. An accidental ground at this point would almost certainly create an undesirable ground loop.

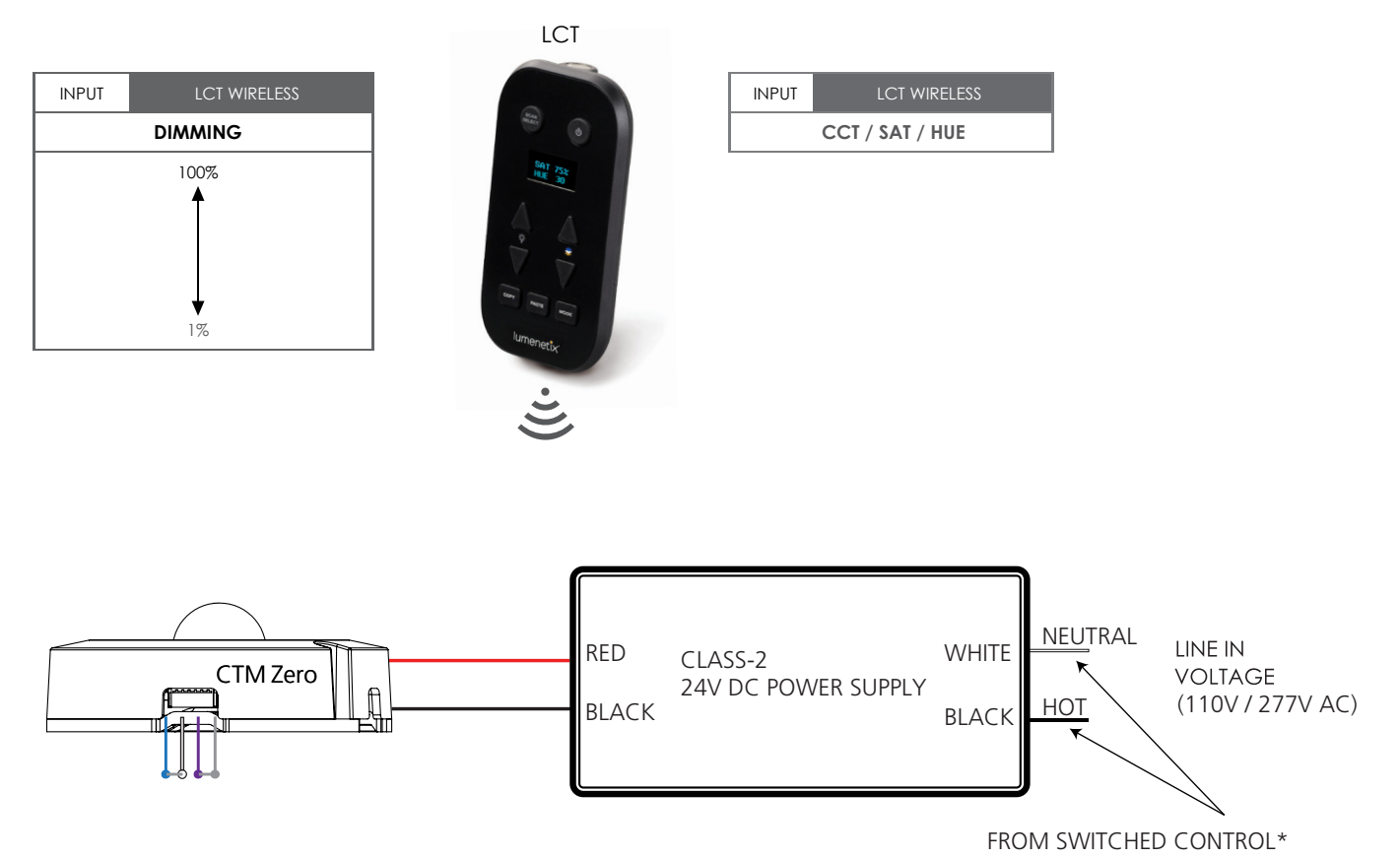
Method-2

A typical two-pair shielded cable can be prepared for termination to the terminals with the drain wire cut off. The drain wire, which is an uninsulated conductor, is sleeved with a insulating tubing to prevent accidental grounding. The crimp-on lug is valuable in this instance to retain the tubing. Insulating tape or heat-shrink tubing is again used to protect the cable from contamination and to prevent accidental grounding, since any accidental connection between the drain wire and a chassis, frame, or enclosure would almost certainly create a ground loop.

8 WIRING DIAGRAMS

8.4.1 Wireless Operation using LCT (to control CCT, Dimming, Saturation and Hue)

Wireless Operation. CTM is shipped with the wireless mode enabled as the two pairs of control wires are grounded. In this mode the Light Commissioning Tool (LCT) provides complete control of the CCT, Dimming, Saturation & Hue.



Lead Color and Input

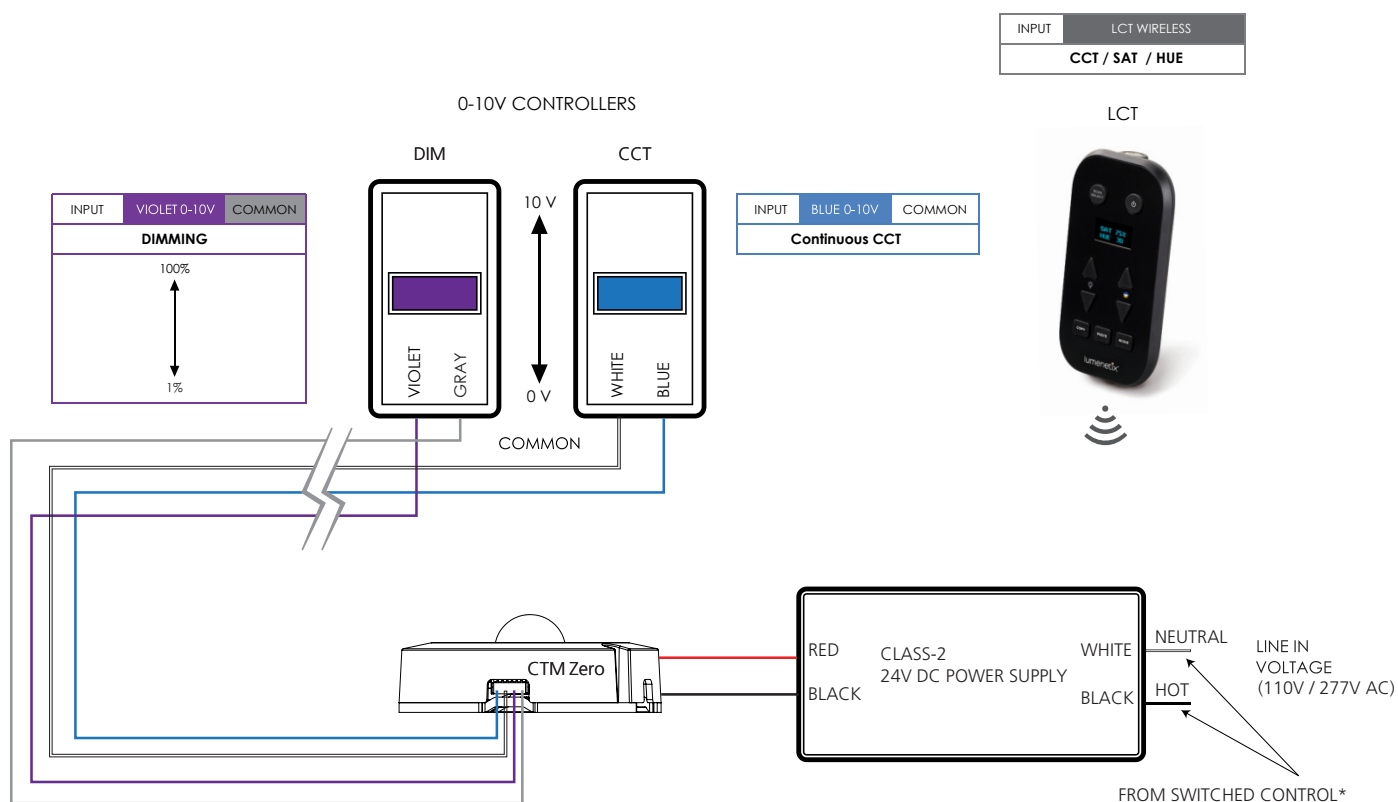
Lead Color	Input
Red	Power 24V DC (+)
Black	Power Common (-)
Violet	0-10V Dimming + (Tied to Gray Common)
Gray	Signal Common for 0-10V Dimming (-)
Blue	0-10V Color + (Tied to White Common)
White	Signal Common for 0-10V Color (-)

Lumenetix part #s:
28.002.001.01 (power cable assembly)
28.002.002.01 (control cable assembly)

8 WIRING DIAGRAMS

8.4.2 0-10V Analog Control of Continuous CCT & Dimming / LCT Control of Saturation & Hue

0-10V Continuous CCT Control. Remove power from the CTM. Connect a 0-10V control device to the blue (+) and white (-) wires. When the CTM is powered up, the 0-10V control will adjust the CCT over the tunable range. The Light Commissioning Tool (LCT) will control Saturation and Hue. A 0-10V control may also be added for dimming (as shown). LCT adjustments to Dimming levels are a percentage of the 0-10V Dim setting (Trim). If a 0-10V control is not used for dimming, the violet (+) and gray (-) wires must be grounded together.



Lead Color and Input

Lead Color	Input
Red	Power 24V DC (+)
Black	Power Common (-)
Violet	0-10V Dimming (+)
Gray	Signal Common for 0-10V Dimming (-)
White	Signal Common for 0-10V Color (-)
Blue	0-10V Color (+)

Lumenetix part #s:

28.002.001.01 (power cable assembly)

28.002.002.01 (control cable assembly)

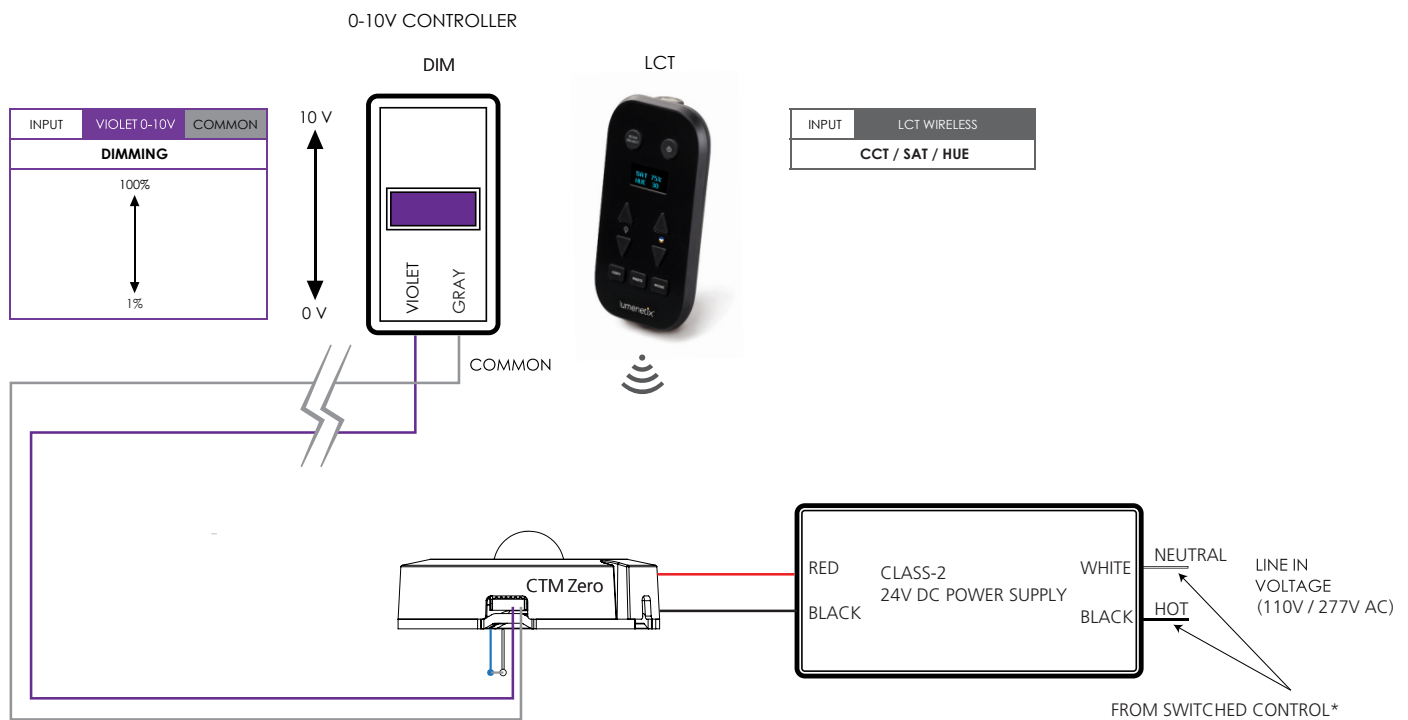
Notes:

1. If SceneSet® is not activated using the LCT, the CTM defaults to 0-10V control of the continuous CCT range.
2. If 0-10V control is not being used for dimming, the violet control lead must be grounded to gray common lead.
3. CTM sources current to 0-10V control at 0.2mA nominal capacity.
4. *If using a wall box dimmer, power only the DIM unit. The CCT unit does not get line-in voltage.

8 WIRING DIAGRAMS

8.4.3 0-10V Analog Control of Dimming / LCT Control of CCT, Saturation and Hue

0-10V Dimming Control Only. Remove power from the CTM. Connect a 0-10V control device to violet (+) and gray (-) wires. When the CTM is powered up, the 0-10V control device will adjust Dimming from 100-1%. Use the Light Commissioning Tool (LCT) to set CCT, Dimming, Saturation, and Hue to the desired levels and use Copy and Paste functions to match lamp settings. In this configuration, the LCT trims the dimming level, i.e., adjustments to Dimming levels as a percentage of the 0-10V Dimming setting (Trim). Preset controls are not available in this configuration.



Lead Color and Input

Lead Color	Input
Red	Power 24V DC (+)
Black	Power Common (-)
Violet	0-10V Dimming (+)
Gray	Signal Common for 0-10V Dimming (-)
White	Signal Common for 0-10V Color (-)
Blue	0-10V Color (Connect to White Common)

Notes:

1. CTM sources current to 0-10V control at 0.2mA nominal capacity.
2. Only pins 1 and 6 are used on the control cable assembly.
3. *If using a wall box dimmer, power only the DIM unit. The CCT unit does not get line-in voltage.

Lumenetix part #s:

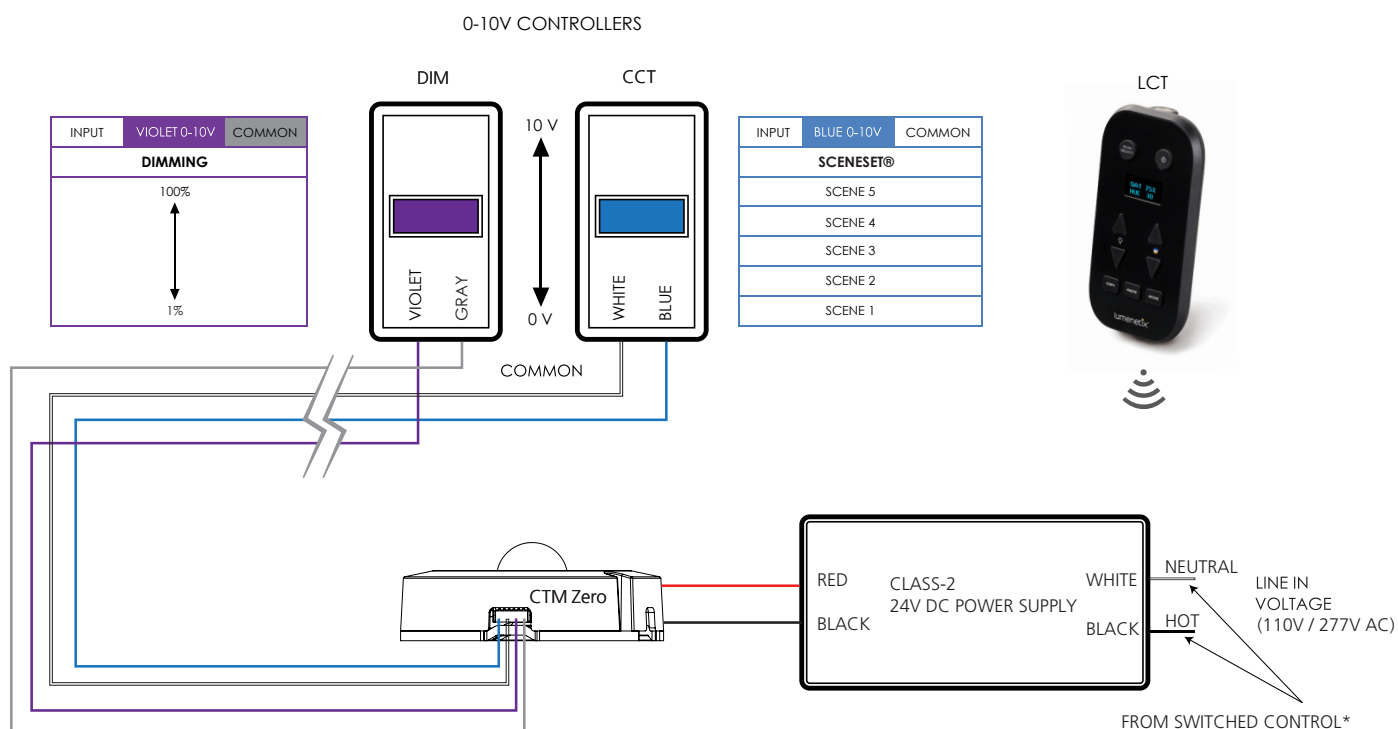
28.002.001.01 (power cable assembly)

28.002.002.01 (control cable assembly)

8 WIRING DIAGRAMS

8.4.4 0-10V Analog Control of SceneSet® / LCT to Set or Amend SceneSet®

0-10V Preset Control. Remove power from the CTM. Connect a 0-10V control device to the blue (+) and white (common) wires. Use the Light Commissioning Tool (LCT) to set, store and enable up to five preset scenes comprised of CCT, Dimming, Saturation and Hue levels. The 0-10V control will toggle between the preset scenes. A 0-10V control may also be added for dimming (as shown) and will proportionally Dim from the stored value in the preset. If a 0-10V control is not used for dimming, the violet (+) and gray (common) wires must be grounded together.



Lead Color and Input

Lead Color	Input
Red	Power 24V DC (+)
Black	Power Common (-)
Violet	0-10V Dimming (+)
Gray	Signal Common for 0-10V Dimming (-)
White	Signal Common for 0-10V Presets (-)
Blue	0-10V Presets (+)

Lumenetix part #s:

28.002.001.01 (power cable assembly)

28.002.002.01 (control cable assembly)

Notes:

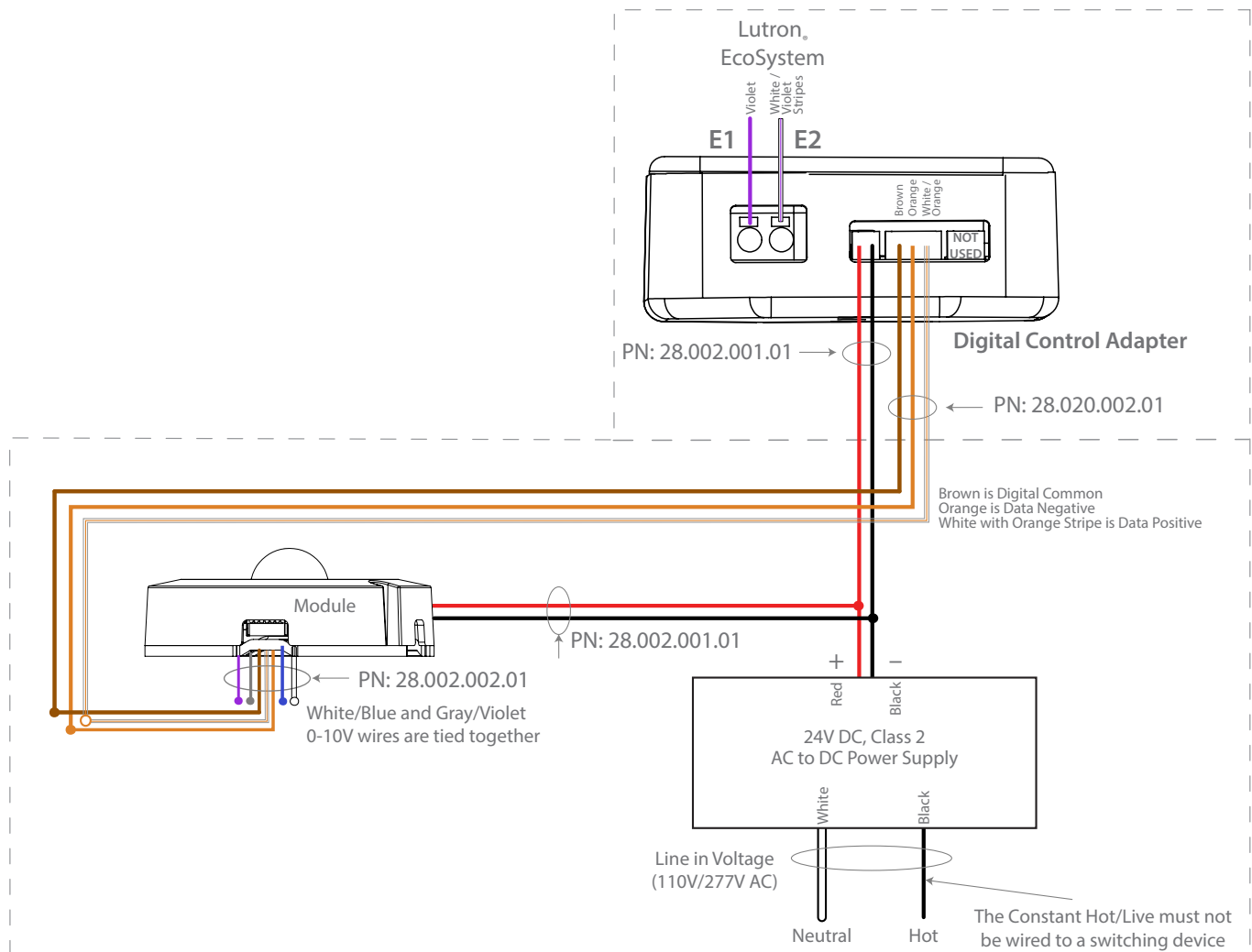
1. SceneSet® is commissioned and activated using the LCT. See LCT operating instructions.
2. If 0-10V control is not being used for dimming, the violet control lead must be grounded to gray common lead.
3. CTM sources current to 0-10V control at 0.2mA nominal capacity.
4. *If using a wall box dimmer, power only the DIM unit. The CCT unit does not get line-in voltage.

8 WIRING DIAGRAMS

8.4.5 Lutron® EcoSystem Input; DCA-1A (24V DC) Digital Control Adapter

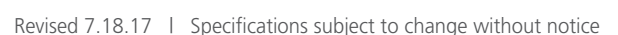
Notes:

1. 24V power (red/black) is Class-2 rated.
2. Module Data +/- (white with orange stripe/orange) to araya⁵ modules is Class-2 rated.
3. Adapter is configured at factory for EcoSystem inputs.
4. DCA may be installed in the luminaire only.
5. One EcoSystem address (1 channel for warm-dim) per DDM module/DCA kit.
6. Two EcoSystem addresses (1 channel for CCT control and 1 channel for dimming control) per CTM module/DCA kit.
7. EcoSystem Channel 1 is always Intensity control. EcoSystem Channel 2 is always CCT control.
8. In the EcoSystem programming mode, EcoSystem Channel 1 controls the intensity from 100%-1%. EcoSystem Channel 2 controls the CCT range from 1650 - 4000K and 2700 - 6000K.
9. CAUTION: The power cable should ONLY be plugged into the 2-pin power receptacle provided. Insertion of the cable into any other slot will damage the Digital Control Adapter unit.
10. LX Output used with this system.



8.4.6 DMX Input; DCA-1B (24V DC) Digital Control Adapter

1. 24V power (red/black) is Class-2 rated.
2. Module Data +/- (white with orange stripe/orange) to araya[®] modules is Class-2 rated.
3. Adapter is configured at factory for DMX (including Bluetooth) inputs.
4. DCA may be installed in the luminaire only.
5. CAUTION: The power cable should ONLY be plugged into the 2-pin power receptacle provided. Insertion of the cable into any other slot will damage the Digital Control Adapter unit.
6. LX Output used with this system.



9 OPERATION GUIDE

The araya⁵ Color Tuning Modules CTM 0ND and CTM 0TD utilize standard 0-10V building controls and/or a wireless Light Commissioning Tool (LCT) for controlling on-Planckian correlated color temperatures (CCT), dimming values, off-Planckian color points (color tinting) using the Saturation & Hue feature, and commissioning and activating SceneSet®. This document describes how to control the CTM utilizing 0-10V controls, the wireless remote or a combination of the two.

Light Commissioning Tool (LCT). The araya⁵ LCT wirelessly controls the CTM. While the LCT can act as a stand-alone wireless controller, it is primarily intended to commission the CTM after installation. Each CTM has a unique address and the operator uses the LCT to select the desired CTM, turn power on/off and then set CCT, Dim, Saturation & Hue, and set Scene Presets. The LCT can also be used to trim the dimming levels when 0-10V dimming control is enabled. Consult the LCT Operation Guide for detailed instructions.

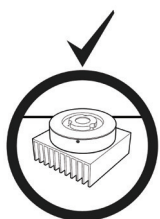
0-10V Control. The CTM has 0-10V control wire pairs to control Dimming and CCT. Dimming is controlled by the violet (+) and grey (-) wires. CCT is controlled by the blue (+) and white (-) wires. When a control wire pair is grounded together, the 0-10V control mode is disabled, and the corresponding function is controlled via the LCT.

Hybrid (wired & wireless) Control. 0-10V controls and the LCT can be used together to control the CTM. These are the features:

Trim. When 0-10V Dimming is enabled, the LCT can adjust the dimming level as a percentage of the 0-10V wired setting.

SceneSet. The LCT can set up to 5 Scene Presets which are recalled using a wired 0-10V controller. A scene is comprised of a CCT, Dim and Saturation & Hue level. Individual preset scenes also can be modified and activated with the LCT.

On-Off Control. The CTM may be turned on-off by switching the input power from the 24V supply. To store the settings, the lamp needs to remain on for at least 45 seconds after the CTM is initially set using the LCT. When Scene Presets are activated using the LCT, the settings are stored immediately and no wait time is needed. The lamp may also be turned on-off using the LCT without switching the power supply, but a power draw of about 1W will remain.



For long term reliable operation, proper heat sinking is critical.



The CTM dome diffuser is fragile. Avoid touching the dome diffuser during handling and assembly.



Do not rest or operate the CTM face down against a table or other solid surface.



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