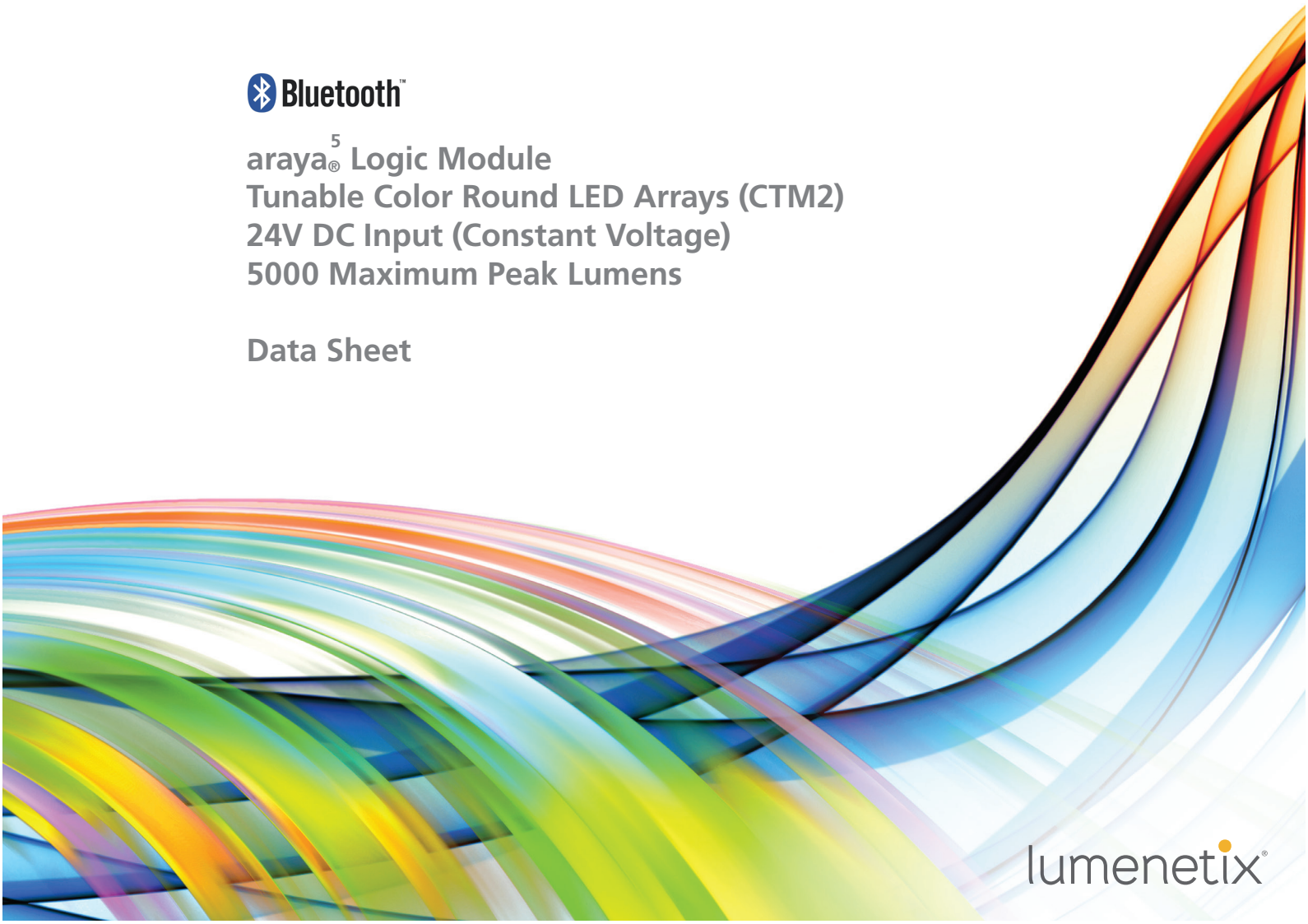
araya 5®

TUNABLE COLOR

Bluetooth™

araya 5® Logic Module
Tunable Color Round LED Arrays (CTM2)
24V DC Input (Constant Voltage)
5000 Maximum Peak Lumens

Data Sheet



lumenetix®

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1 DESCRIPTION AND KEY FEATURES

2016 IES PROGRESS REPORT SELECTION • 2016 LFI INNOVATION AWARDS CATEGORY WINNER • 2016 LUX AWARDS HIGHLY COMMENDED • 2016 EDISON REPORT TOP TEN MUST SEE LIST

araya5® Tunable Color Round LED Arrays

araya5® Logic Modules

Description

araya5 Logic Modules (ALM) connect to tunable color high-power round LED arrays that mix five colors of LEDs to deliver tunable and dimmable white light at 90+ CRI* with color consistency of <2 step MacAdam ellipse (SDCM) across a tuning range of 1650 - 8000K. The ALM is connected to one LED array via low-cost ribbon cables, and features on-board driver electronics and the araya5 control logic for precise control of LED light output while tuning and dimming. On-board closed loop thermal feedback compensates each color channel for thermally induced variations in light output due to dimming or changes in 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 LED array. A patented in-line manufacturing process captures and stores the spectral characteristics of each LED on the array, rapidly generating a unique color model for each array. Delivered light can be dimmed from 100 - 0.1%** in increments of 1% at constant CCT. Gradients of saturated colors from 1 - 100% can be added to color points within the tuning range. The Zhaga-compliant LED arrays are compatible with traditional 0 - 10V wired controls and feature on-board Bluetooth Low Energy (BLE). The arrays can access DMX512-A-RDM, Legrand Wattstopper's Digital Light Management (DLM) control interface, DALI Type 8 or Lutron® EcoSystem inputs via an optional accessory board that connects to an electrically isolated expansion port within the ALM. For simple deployment, SceneSet™ allows up to five scenes to be pre-programmed into the LED array during production and recalled at the venue using a 0 - 10V recommended dimmer or via Bluetooth. Commissioning of the LED array and the re-programming of Sceneset is done via the wireless araya5 Tunable Color 2.0 iOS app that connects to the embedded Bluetooth radio.

Key Features

- Tunable range: 1650 - 8000K
- 90+ CRI*
- Dimmable from 100 - 0.1%** at constant CCT
- Color gamut control: gradients of saturated colors from 1 - 100% can be added to color points
- Integrated driver electronics and araya5® logic
- On board thermal and optical feedback for color consistency of <2 step MacAdam ellipse over 50,000 hour life
- In-line spectral capture and storage creates an unique color model for each Zhaga-compliant LED array, resulting in consistent CRI and CCT across all arrays
- On-board thermal turndown
- Compatible with 0 - 10V wired controls
- On-board Bluetooth Low Energy (BLE)
- DMX512-A-RDM, Wattstopper DLM, DALI Type 8 or Lutron EcoSystem control accessibility via optional accessory board that connects to an electrically isolated compartment within the ALM
- SceneSet enables up to five scenes to be preprogrammed and recalled using a 0 - 10V recommended dimmer or via Bluetooth
- DMX slots set by RDM or via wireless araya5 Tunable Color 2.0 iOS app

araya 5 TUNABLE COLOR 2.0

araya5 Tunable Color 2.0 iOS App

2 ORDERING INFORMATION

Photometrics and Ordering Codes (Round LED Array Kits)[1]

	Tunable Range	LES[3]	Peak Source Lumens	Peak Delivered Lumens[4]	Nominal Wattage (±10%)	Ordering Code
Specifications[2]	1650 - 8000K	31.6 mm	5000	4350	60W	80.002.007.02**
		19.7 mm	3000	2600	50W	80.002.006.02**
			2000	1700	30W	80.002.005.01
			1200	1050	18W	80.002.003.01
		12.6 mm	2000	1700	30W	80.002.002.01
		9.6 mm	1500	990	20W	80.002.001.01
CRI (Ra) Across Tuning Range	>90*					
Dimming	100% to 0.1%**					
Nominal Color Consistency	<2 step 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					

1. Kits include round LED array and araya[5] Logic Module with on-board 0-10V and Bluetooth LE. The kits do not include ribbon cables, power cable assembly, control cable assembly, or accessory boards (see below for accessory ordering specifications).
2. Specifications are within +/- 10% of the nominal value. Peak efficacy is not necessarily at typical peak lumens.
3. LES = Light Emitting Surface.
4. Peak delivered lumen values are listed for modules tested with the included dome diffuser.

*From 2000 - 6000K.

**100 - 0.1% dimming is available for the indicated modules when connected to digital controls.
100 - 1% dimming is available with analog 0 - 10V control, and for all other modules regardless of control type.

Required Accessories (Ordered Separately)

Quantity	Description	Ordering Code
1	18" long jacketed/round 16-pin ribbon cable (16-pin Tyco Connector at one end, 20-pin JST connector at other end) (for connecting ALM to round array)	28.700.003.03
1	18" long flat 16-pin ribbon cable (16-pin Tyco Connector at one end, 20-pin JST connector at other end) (for connecting ALM to round array)	28.700.001.05
1	24" long 2-wire ALM power cable assembly	28.030.001.01
1	24" long 7-wire ALM control cable assembly	28.002.002.01
1	DMX512-A-RDM Accessory Board***	80.003.001.01
1	Lutron® Accessory Board***	80.003.002.02
1	DALI Accessory Board***	80.003.004.01
1	Legrand Wattstopper DLM - LMLM Module***	80.003.003.03

***Accessory boards for different controls should NOT be interchanged in the field. This will void the Lumenetix warranty. Please contact your Lumenetix sales representative for details.

3 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications (araya5® LOGIC MODULE)

Input Voltage	24V DC (Constant Voltage)
Nominal Power Input	30W, 40W, 60W, and 80W
Nominal Current Input	1.25A (30W); 1.7A (40W); 2.5A (60W); 3.3A (80W)
Power Supply Classification	Class 2
Power and Control Connector	Power Connector: Molex 5023520200; Control Connector: Molex 874380743
Ribbon Cable Connector (supplied by third parties)	TE Micro-Match 215460-4 (requires TE mating connector 2-215083-0)
Control Options***	0–10V, DMX512-A-RDM, Wattstopper DLM, Bluetooth LE, Lutron® EcoSystem, DALI Type 8
CCT and Dimming Control Connections	Plug-in connector for 24 gauge leads

***DMX512-A-RDM, Lutron EcoSystem, DALI Type 8 or Wattstopper Digital Light Management control compatibility requires optional accessory board.

NOTE: Remote Device Management or RDM is a protocol enhancement to DMX512-A that allows bi-directional communication between a lighting or system controller and attached RDM compliant devices over a standard DMX line.

IMPORTANT

The araya5 Logic Module (ALM) has on-board drive electronics, including dimming. A dimming driver should NOT be used.

3.2 Recommended Power Supplies (Constant Voltage)

Manufacturer	Part Number	Rated Power	9 mm array (20W) tested	12 mm array (30W) tested	19 mm array (18W) tested	19 mm array (30W) tested	19 mm array (50W) tested	32 mm array (60W) tested
Roal	RSLP035-24	35W	✓					
Thomas Research	LED40W-024	40W	✓					
Thomas Research	LED50W-024	50W	✓					
Meanwell	LPV-60-24	60W					✓	
Roal	RSLP070-24	70W						✓
Meanwell	LPF-90-24	90W						✓
Amperor	ANP101-24P-12774160L	100W						✓

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:

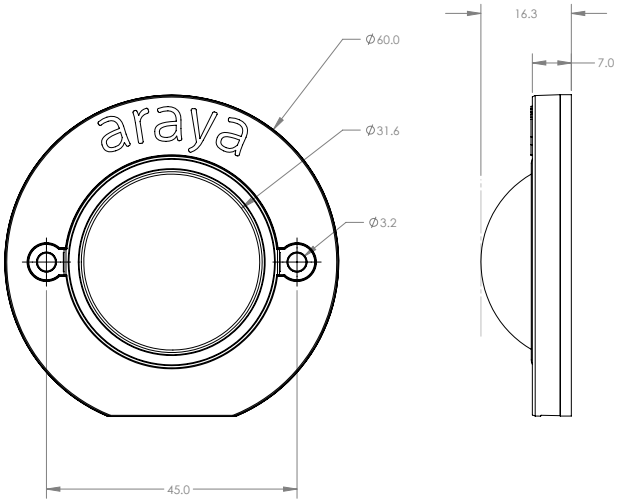
- Recommendations are subject to change. Consult your Lumenetix representative for the most updated list.
- Power supply qualification process: if a power supply that is not part of the above list is submitted for testing to Lumenetix (during the design-in phase), it will be qualified or disqualified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

4 MECHANICAL SPECIFICATIONS

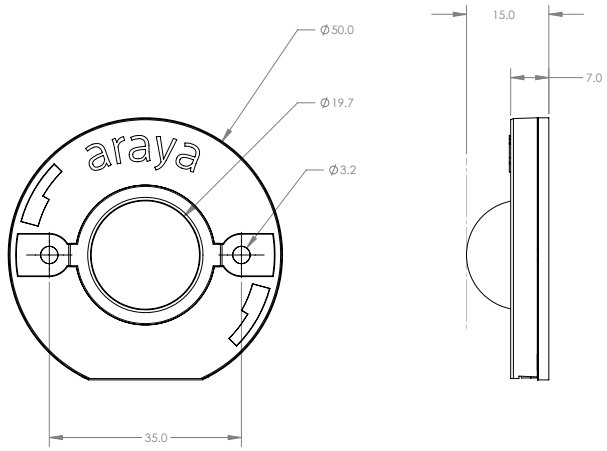
4.1 Round LED Array Kits

Array Dimensions (LES; Diameter 'D'; Height 'H')	LES = 31.6 mm (nominal 1.24 in.)	D = 60 mm (nominal 2.36 in.); H = 16.3 mm (nominal 0.64 in.)
	LES = 19.7 mm (nominal 0.78 in.)	D = 50 mm (nominal 1.97 in.); H = 15 mm (nominal 0.59 in.)
	LES = 12.6 mm (nominal 0.50 in.)	D = 50 mm (nominal 1.97 in.); H = 12.9 mm (nominal 0.51 in.)
	LES = 9.6 mm (nominal 0.38 in.)	D = 40 mm (nominal 1.57 in.); H = 10.1 mm (nominal 0.40 in.)

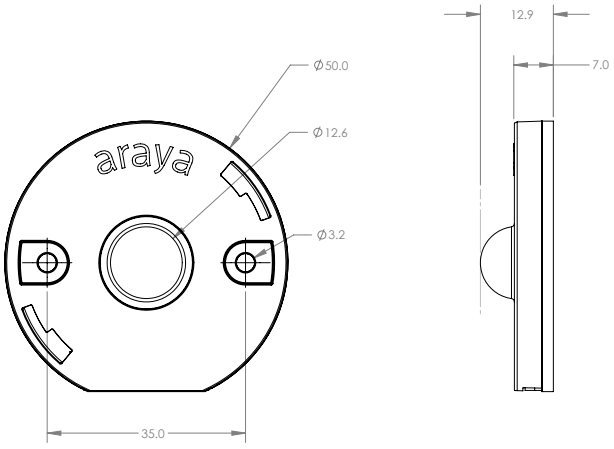
LES = Light Emitting Surface.



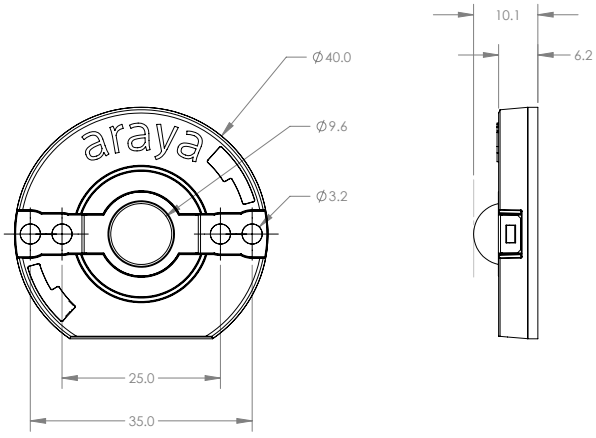
araya5 Round LED Array (31.6 mm LES; 5000 lumens)
All dimensions are in millimeters.



araya5 Round LED Array (19.7 mm LES; 3000/2000/1500/1200 lumens)
All dimensions are in millimeters.



araya5 Round LED Array (12.6 mm LES; 2000 lumens)
All dimensions are in millimeters.



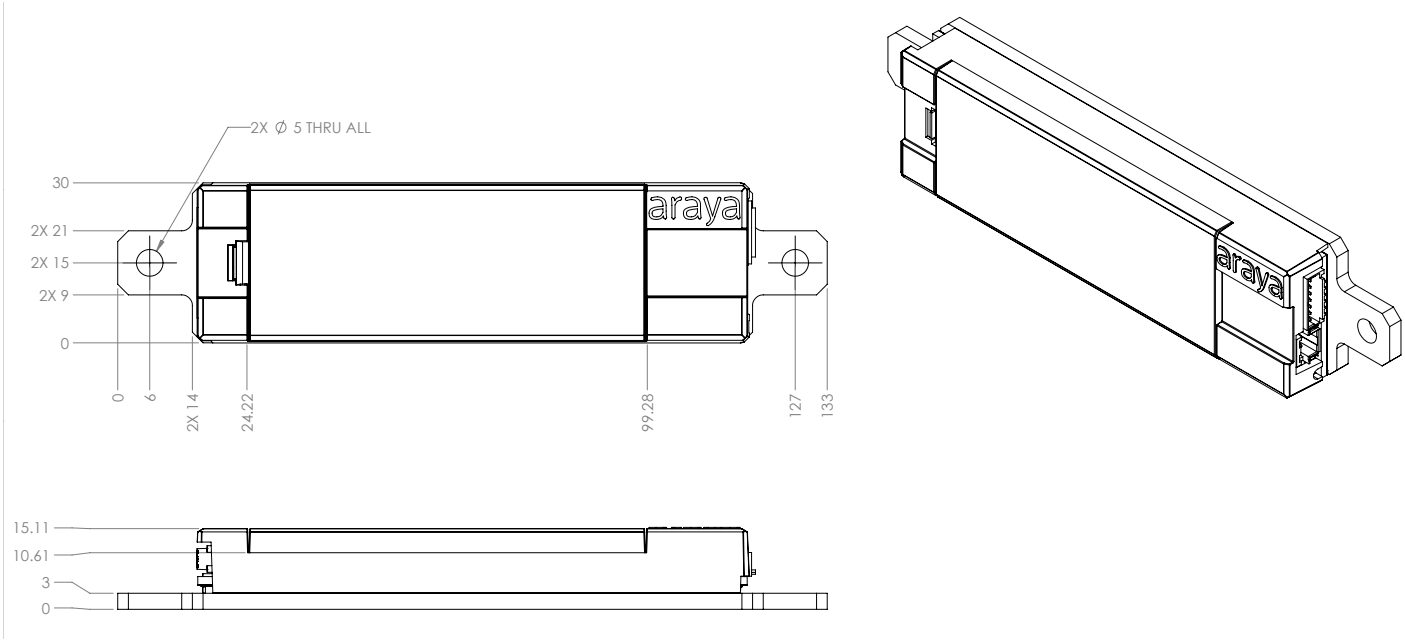
araya5 Round LED Array (9.6 mm LES;1500 lumens)
All dimensions are in millimeters.

4 MECHANICAL SPECIFICATIONS

4.2 araya5 Logic Module

ALM Dimensions (H x W x L)	H = 15.11 mm (0.60 in.); W = 30 mm (1.18 in.); L = 133 mm (5.24 in)

Dimensions provided are for the ALM without optional accessory boards.

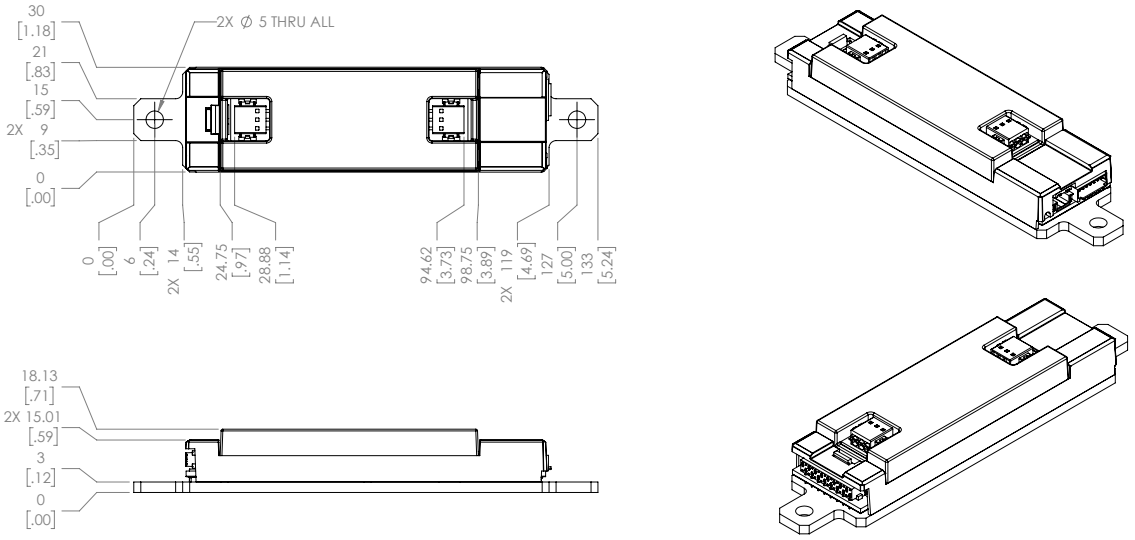


araya5 Logic Module
All dimensions are in millimeters. The mounting holes are 5 mm in diameter.

5 DMX512-A ACCESSORY BOARD

5.1 araya5 Logic Module with DMX512-A-RDM Accessory Board

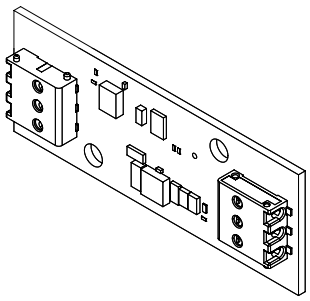
ALM Dimensions (H x W x L)	H = 17.61 mm (0.69 in.); W = 30 mm (1.18 in.); L = 133 mm (5.24 in.)



araya5 Logic Module with DMX Accessory Board and Cover
Dimensions outside parentheses are in millimeters. Dimensions within parentheses are in inches.
The mounting holes are 5 mm in diameter.

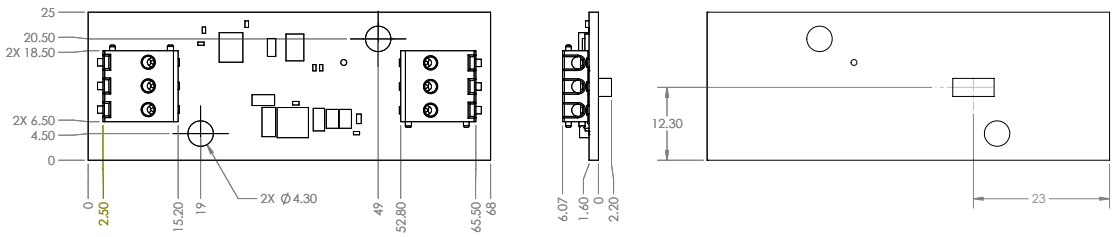
5.2 Mechanical Specifications (DMX512-A-RDM Accessory Board)

Lumenetix part #:
80.003.001.01



Wire Specifications:
22-24 AWG, stranded tinned copper (TC) only

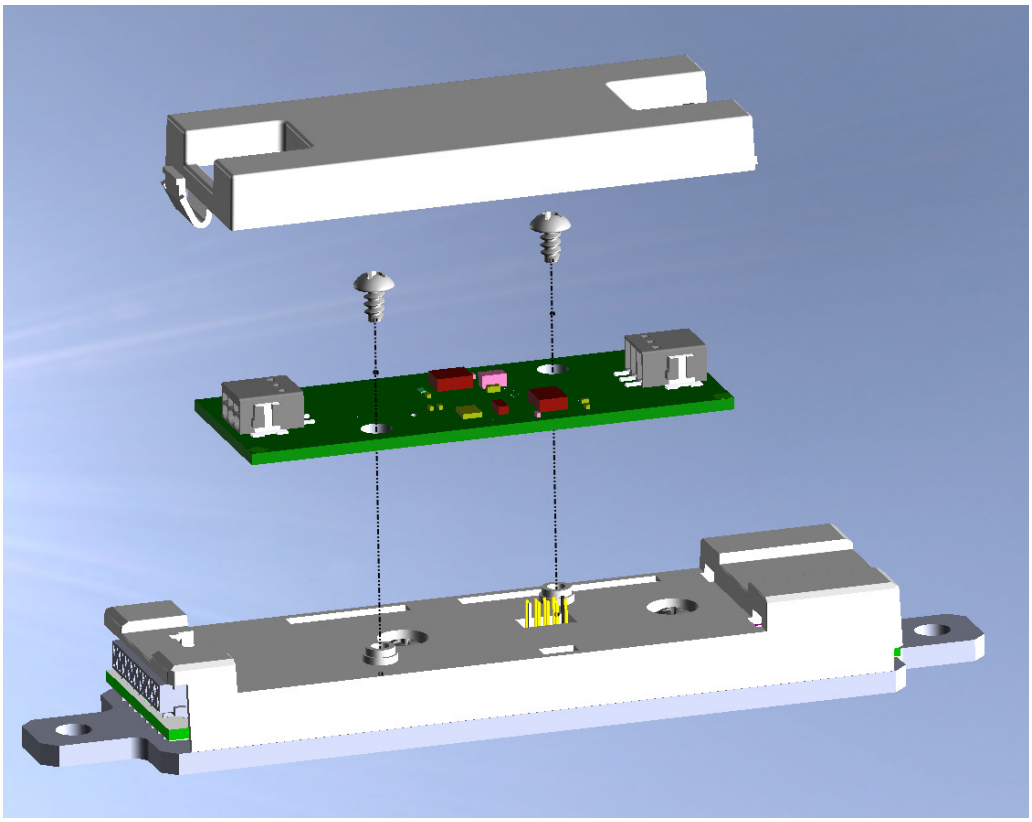
Connector:
Phoenix Contact 1771033



DMX Accessory Board
All dimensionss are in millimeters.

5 DMX512-A ACCESSORY BOARD

5.3 Mounting Specifications (DMX Accessory Board)



The Accessory Board is mounted on the 10-pin header and located on the two bosses, and then captured in place to the ALM with two (2) self-tapping screws.

Screw Specifications: Phillips Rounded Head Thread-Forming Screws for Plastic, 18-8 Stainless Steel, Number 4 Size, 1/8" Long; McMasterCarr # 99461A105.

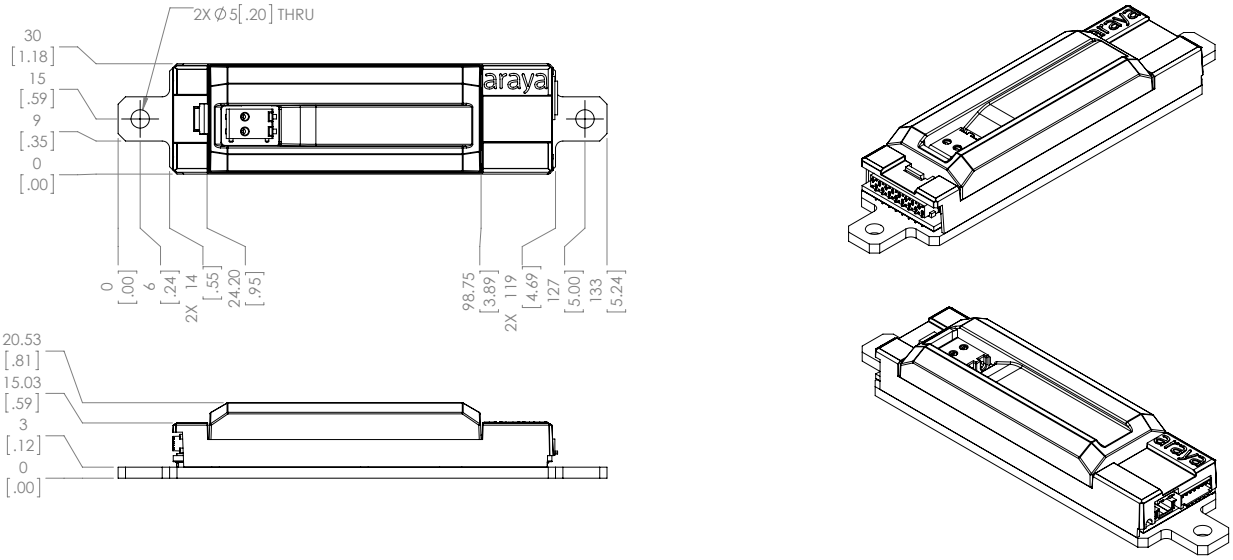
Torque Specifications: 2.0 to 2.5 in-lb

CAUTION: The screws are very small and are self-threaded into small plastic bosses. Overtorquing will strip the plastic and damage the ALM housing.

6 LUTRON ACCESSORY BOARD

6.1 araya5 Logic Module with Lutron® EcoSystem Accessory Board

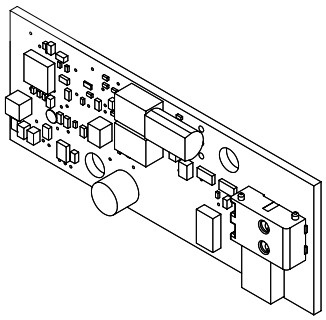
ALM Dimensions (H x W x L)	H = 20.53 mm (0.81 in.); W = 30 mm (1.18 in.); L = 133 mm (5.24 in.)



araya5 Logic Module with Lutron Accessory Board and Cover
Dimensions outside parentheses are in millimeters. Dimensions within parentheses are in inches.
The mounting holes are 5 mm in diameter.

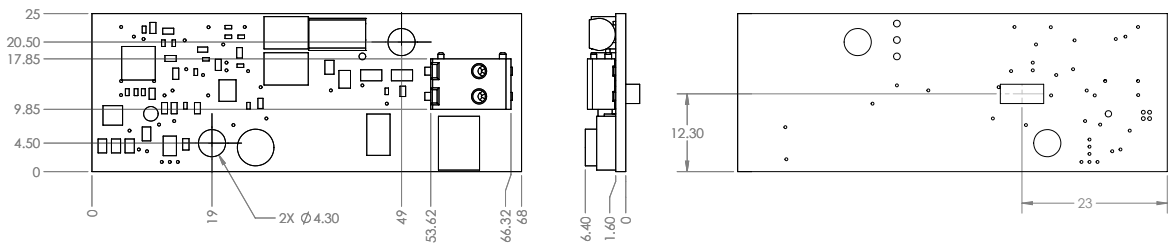
6.2 Mechanical Specifications (Lutron EcoSystem Accessory Board)

Lumenetix part #:
80.003.002.02



Wire Specifications:
18-22 AWG, solid wire or tin-dipped stranded

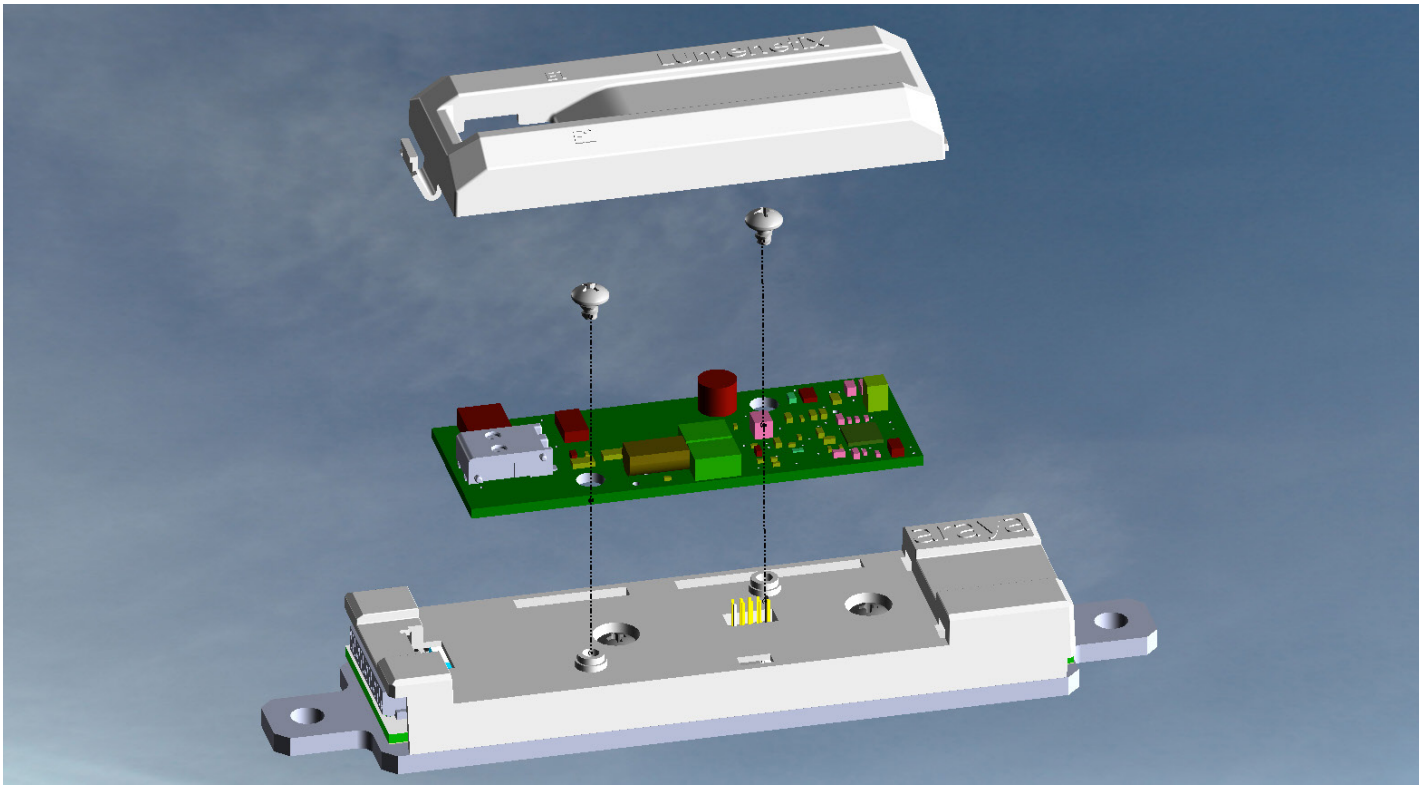
Connector:
TE 2834006-2



Lutron Accessory Board
All dimensionss are in millimeters.

6 LUTRON ACCESSORY BOARD

6.3 Mounting Specifications (Lutron EcoSystem Accessory Board)



The Accessory Board is mounted on the 10-pin header and located on the two bosses, and then captured in place to the ALM with two (2) self-tapping screws.

Screw Specifications: Phillips Rounded Head Thread-Forming Screws for Plastic, 18-8 Stainless Steel, Number 4 Size, 1/8" Long; McMasterCarr # 99461A105.

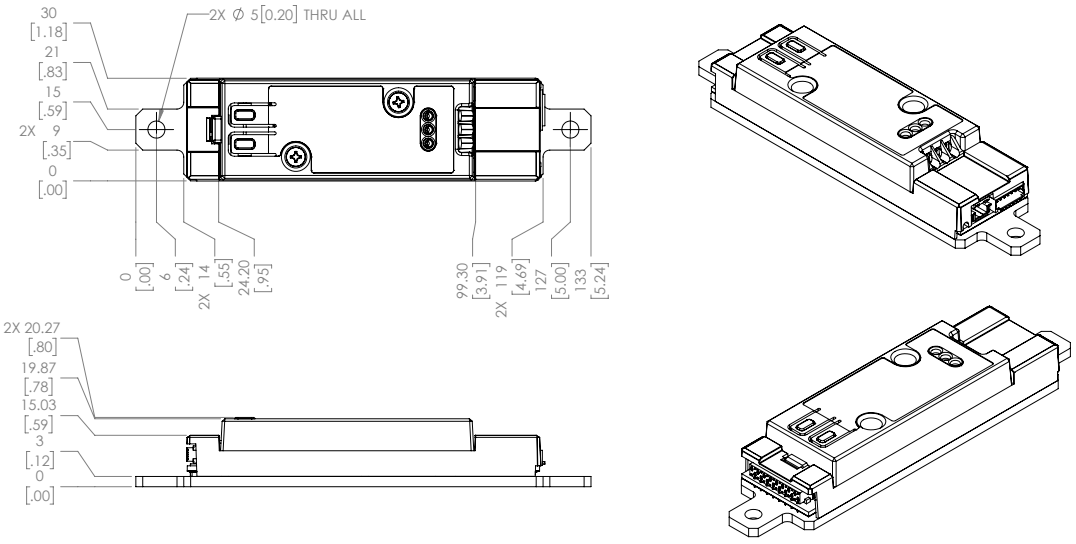
Torque Specifications: 2.0 to 2.5 in-lb

CAUTION: The screws are very small and are self-threaded into small plastic bosses. Overtorquing will strip the plastic and damage the ALM housing.

7 WATTSTOPPER DLM — LMLM MODULE

7.1 araya5 Logic Module with Legrand Wattstopper's DLM LMLM Module

ALM Dimensions (H x W x L)	H = 20.27 mm (0.80 in.); W = 30 mm (1.18 in.); L = 133 mm (5.24 in.)



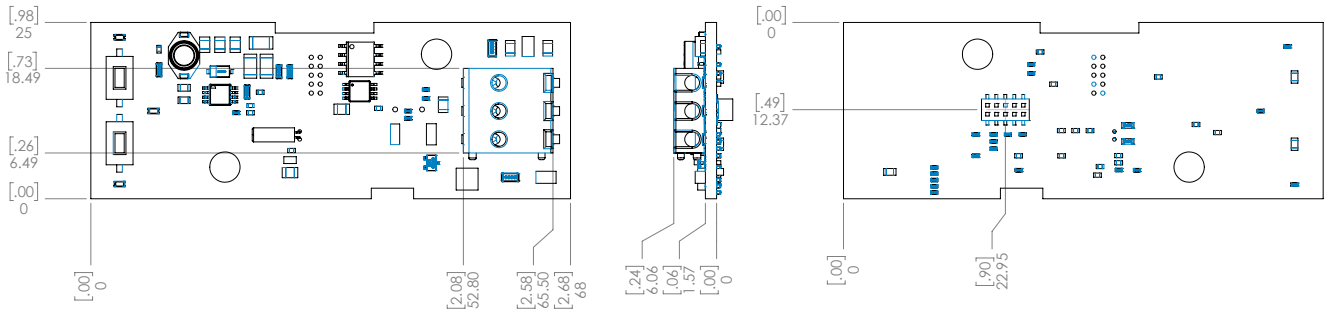
araya5 Logic Module with LMLM Module and Cover
Dimensions outside parentheses are in millimeters. Dimensions within parentheses are in inches.
The mounting holes are 5 mm in diameter.

7.2 Mechanical Specifications (LMLM Module)

Lumenetix part #:
80.003.003.03

Wire Specifications:
Solid 20/3 AWG, red/blue/black

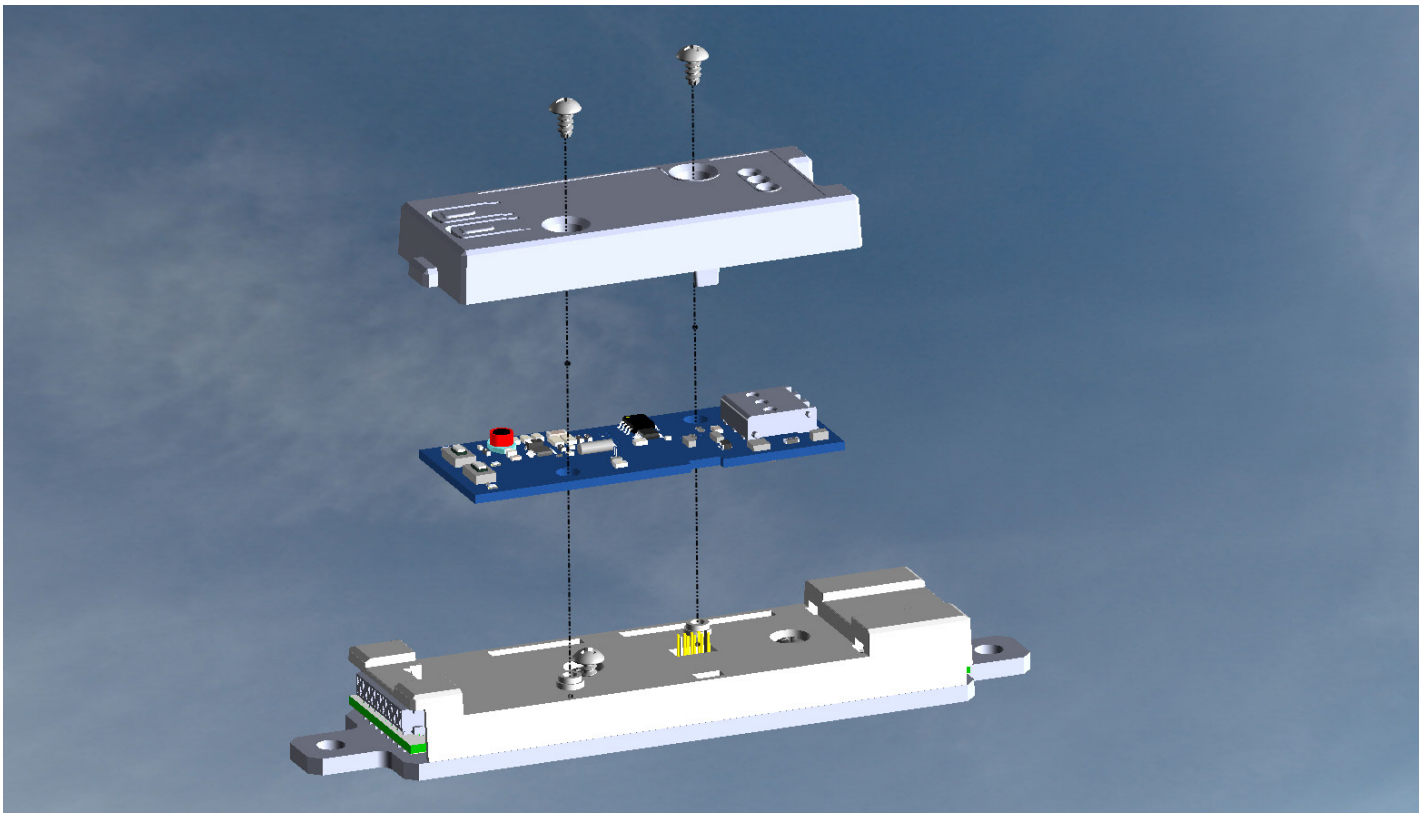
Connector:
TE 2834006-3



Legrand Wattstopper DLM LMLM Module
Dimensions outside parentheses are in millimeters. Dimensions within parentheses are in inches.

7 WATTSTOPPER DLM — LMLM MODULE

7.3 Mounting Specifications (LMLM Module)



The LMLM Module is mounted on the 10-pin header and located on the two bosses, and then captured in place to the ALM with two (2) self-tapping screws.

Screw Specifications: Phillips Rounded Head Thread-Forming Screws for Plastic, 18-8 Stainless Steel, Number 4 Size, 1/8" Long; McMasterCarr # 99461A105.

Torque Specifications: 2.0 to 2.5 in-lb

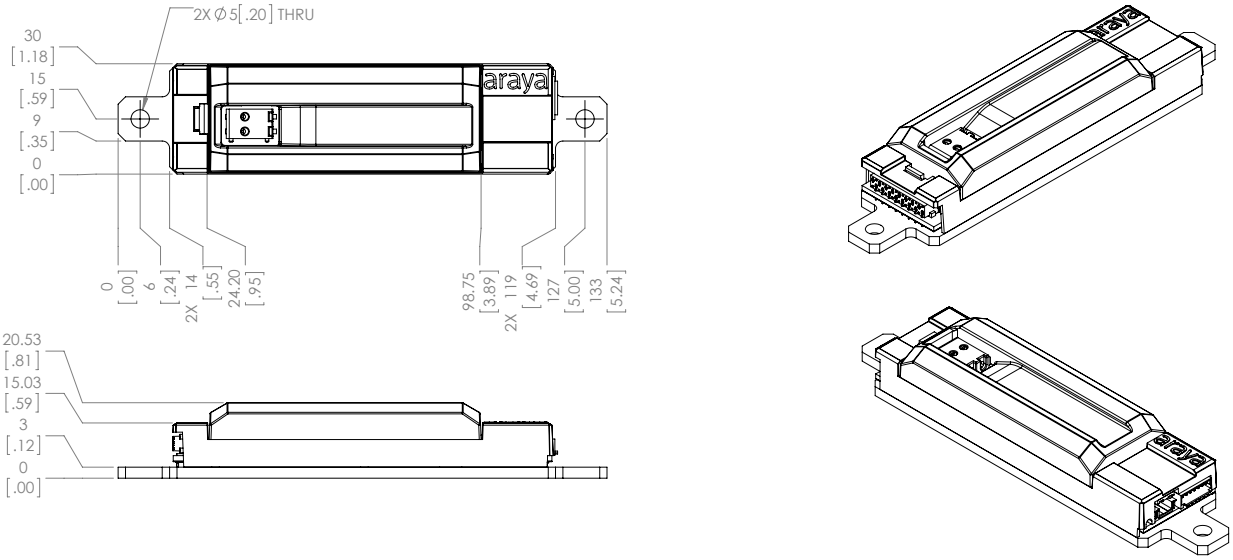
CAUTION: The screws are very small and are self-threaded into small plastic bosses. Overtorquing will strip the plastic and damage the ALM housing.

Please refer to the Legrand Wattstopper website for detailed specifications, wiring diagrams and installation instructions:
https://www.legrand.us/categories/lightingcontrolsbuildingsystems/human-centric-lighting/led-light-engines.aspx

8 DALI ACCESSORY BOARD

8.1 araya5 Logic Module with DALI Accessory Board

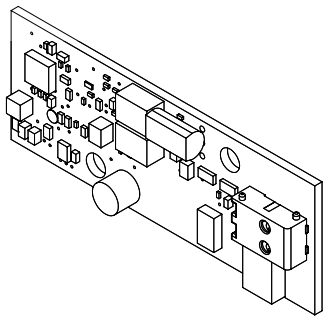
ALM Dimensions (H x W x L)	H = 20.53 mm (0.81 in.); W = 30 mm (1.18 in.); L = 133 mm (5.24 in.)



araya5 Logic Module with DALI Accessory Board and Cover
Dimensions outside parentheses are in millimeters. Dimensions within parentheses are in inches.
The mounting holes are 5 mm in diameter.

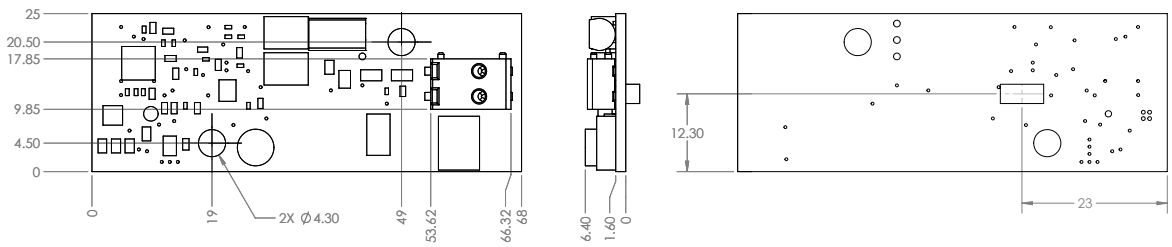
8.2 Mechanical Specifications (DALI Accessory Board)

Lumenetix part #:
80.003.004.01



Wire Specifications:
18-22 AWG, solid wire or tin-dipped stranded

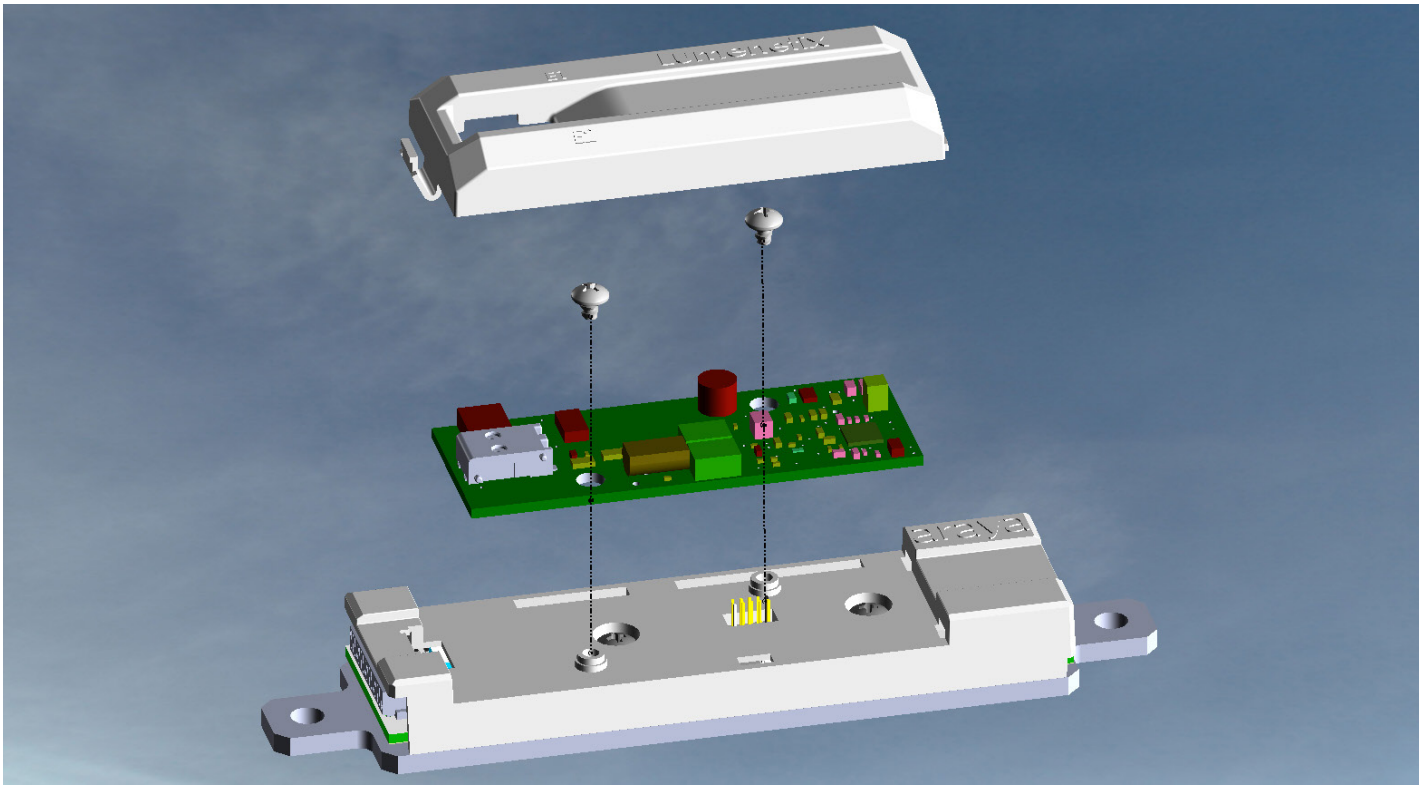
Connector:
TE 2834006-2



DALI Accessory Board
All dimensionss are in millimeters.

8 DALI ACCESSORY BOARD

8.3 Mounting Specifications (DALI Accessory Board)



The Accessory Board is mounted on the 10-pin header and located on the two bosses, and then captured in place to the ALM with two (2) self-tapping screws.

Screw Specifications: Phillips Rounded Head Thread-Forming Screws for Plastic, 18-8 Stainless Steel, Number 4 Size, 1/8" Long; McMasterCarr # 99461A105.

Torque Specifications: 2.0 to 2.5 in-lb

CAUTION: The screws are very small and are self-threaded into small plastic bosses. Overtorquing will strip the plastic and damage the ALM housing.

9 HEAT SINKING RECOMMENDATIONS

The Color Tuning Module requires an external heat sink in order to ensure proper operating temperature of the LEDs. The CTM2 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 CTM2 on a painted aluminum surface will reduce the performance of the heat sink material.

9.1 Compatible Heat Sinks

The following tables list heat sinks models that have compatible form factors and thermal resistance characteristics for use with the CTM2. 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
Modular 9980	99	80	1.02
Modular 9950	99	50	1.34

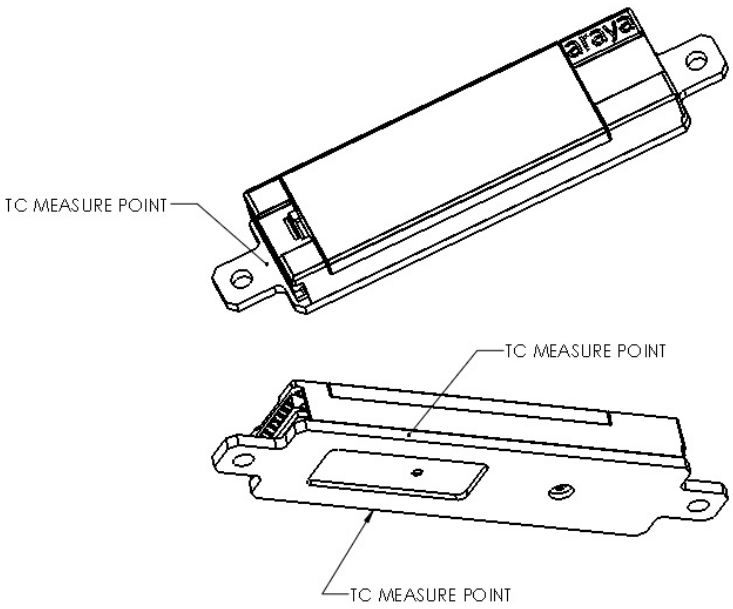
IMPORTANT: These heat sinks are qualified in "free air". If the CTM is installed in an insulated can fixture (IC Can), the module may exceed the recommended operating temperature. The heat sink must be evaluated and temperature tested in the fixture at applicable ambient temperatures for the desired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

These heatsinks are suggested for use as a starting point in free air at an ambient of 25°C, but cannot be guaranteed as the Tc will vary depending on the thermal design of the fixture.

NOTE: In many fixtures, the air flow to the heat sinks is obstructed or the heat sink is in an enclosed container with no path to reject heat. The thermal design of the fixture must be optimized so that the maximum temperature is less than the Tc_{max} (maximum case temperature) as indicated in the following drawings. If the Tc_{max} is exceeded in the application, the junction temperature of the LEDs will be higher than that required to meet the L70 life, and the Lumenetix warranty will be void.

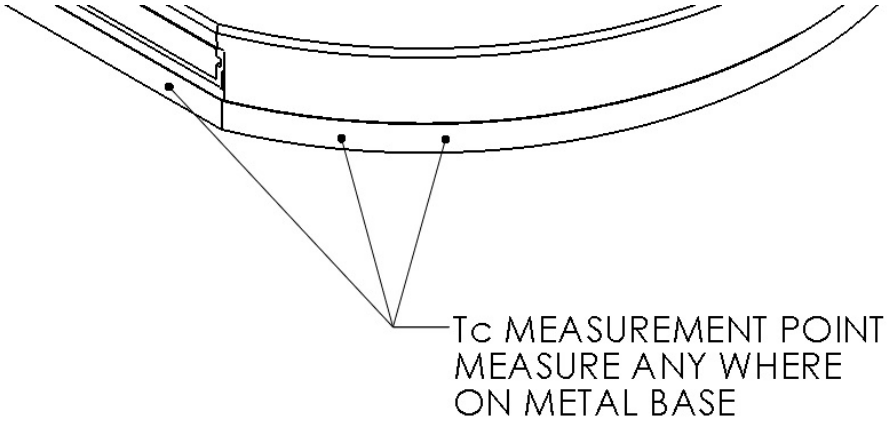
10 CASE TEMPERATURE MEASUREMENT POINTS

10.1 araya® 5 Logic Module (ALM) Case Temperature (Tc) Measurement Points



MAXIMUM CASE TEMPERATURE (Tc) FOR ALM: **70°C**

10.2 Round LED Array Case Temperature (Tc) Measurement Point



Maximum Case Temperature (Tc) for Round LED Array: **90°C**

c UL us
UL Recognized Component
Dry or Damp Locations Class 2 Input

11 SECONDARY OPTICS

11.1 Attaching Compatible Reflectors for Round LED Arrays

The tunable color round LED arrays with 19mm LES (Light Emitting Surface) accept twist-to-lock reflectors with an attachment collar. The fastener specifications are shown in the following table while mounting hole locations are shown in Figures 1, 2 and 3.

CTM One Secondary Optics Fastener Specifications

Attachment Type	Fastener specifications	Screw length	Notes
Twist-Lock (with Adaptor Ring)	M3 x 6; quantity of two	6 mm (1/4")	Pan head screws
Twist-Lock (with Adaptor Ring & Adaptor)	M3 x 6; quantity of two	6 mm (1/4")	Pan head screws
TE Type 2 Clip	M3 x 10; quantity of two	10 mm (3/8")	Rounded head screws

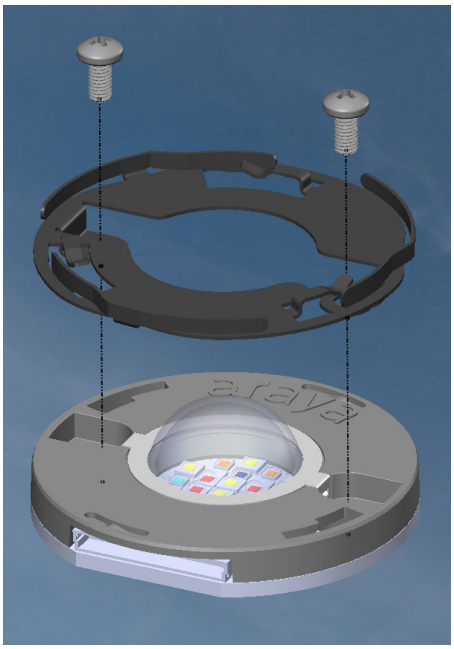


Figure 1: Round LED Array with XSA-242 Adaptor Ring (by Xicato)

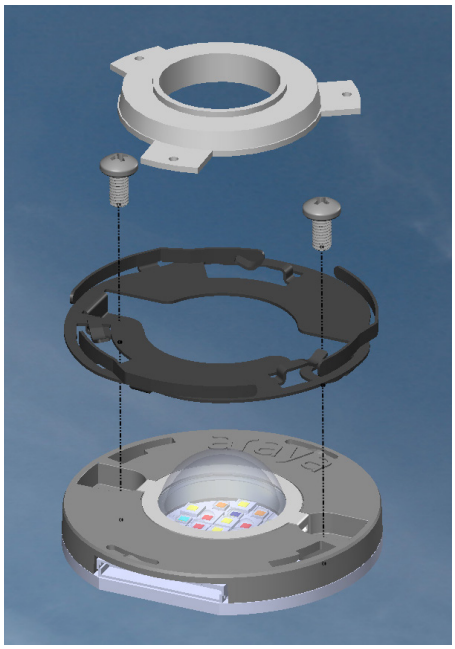


Figure 2: Round LED Array with XSA-242 Adaptor Ring (by Xicato) with Adaptor, used for Reflectors by Diffractive Optics (p/n: P14008) or Khatod (p/n: KE1950W)

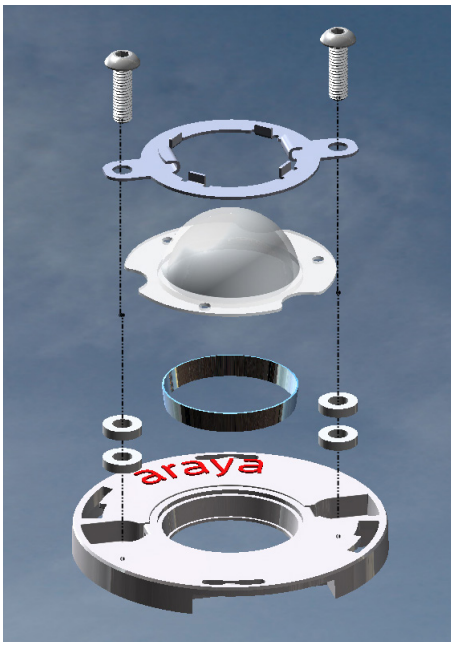


Figure 3: Round LED Array with Lumawise Z50 Type 2 Clip (by TE)

11 SECONDARY OPTICS

11.2.1 Compatible Reflectors List

Compatible Reflectors for 19mm LES round LED arrays **(continued on next page)**

Manufacturer	M. Part Number	beam angle (deg)	outer dim (mm)	height (mm)	optical finish	optical finish 2	attach method
Diffractive Optics	P13302 (XSA-220)	40	50	29	specular	none	XSA242
Diffractive Optics	P13004 (XSA-221)	40	49.3	28.6	specular	faceted	XSA242
Diffractive Optics	P13008 (XSA-223)	40	54.1	42.3	specular	none	XSA242
Diffractive Optics	P13010 (XSA-224)	20	70	42	specular	none	XSA242
Diffractive Optics	P13016 (XSA-227)	20	94.3	83	specular	faceted	XSA242
Diffractive Optics	P13825	10-15	69	33	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13827	20	69	33	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13829	30	69	33	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13765	10-15	75	42.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13767	20	75	42.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13831	30	75	42.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13769	10-15	85	43.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13771	20	85	43.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13833	30	85	43.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13773	10-15	92	43.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13775	20	92	43.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13781	30	92	43.3	specular	superfacet, diamond	XSA242 + P14008
Diffractive Optics	P13713	20	75	37	specular	faceted	XSA242 + P14008
Diffractive Optics	P13715	35	75	37	specular	faceted	XSA242 + P14008
JORDAN	11324 10 10101	25	111	66	specular	super facet	none
JORDAN	11324 00 10101	40	111	66	specular	super facet	none
Khatod EASY	KCLP 1858CR	12	72	52	combination	none	Zhaga Screw 35mm
Khatod EASY	KCLP 1858ME	30	72	52	honeycomb lens	none	Zhaga Screw 35mm
Khatod EASY	KCLP 1858WI	50	72	52	bugeye lens	none	Zhaga Screw 35mm
Khatod EASY	KCLP 1859CR	12	110	61	combination	none	Zhaga Screw 35mm
Khatod EASY	KCLP 1859ME	30	110	61	honeycomb lens	none	Zhaga Screw 35mm
Khatod EASY	KCLP 1859WI	50	110	61	bugeye lens	none	Zhaga Screw 35mm
Khatod EASY	KCLP 1799 CR	asym			specular	none	Zhaga Screw 35mm
Khatod	KCLP 1682 CR (1429CR)	11	65	35	specular	none	TE Type II / XSA242 + KE1950W
Khatod	KCLP 1682 ST (1429ST)	20	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1683 CR (1430CR)	26	65	35	specular	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1683 ST (1430ST)	24	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1431 CR		65	35	specular	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1432 CR		65	35	specular	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1685 ST (1432ST)	32	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1684 ST	28	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1686 CR	44	65	35	specular	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1687 CR	27	65	35	specular	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1687 ST	31	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1688 CR	37	65	35	specular	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1688 ST	38	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1689 ST	42	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1690 ST	50	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	KCLP 1691 ST	56	65	35	diffuse	none	TE Type II / XSA242 + KE1950W
khatod	PLJT 1866	n/a			diffuse ball		XSM242

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.

11 SECONDARY OPTICS

11.2.2 Compatible Reflectors List

Compatible Reflectors for 19mm LES round LED arrays **(continued from previous page)**

Manufacturer	M. Part Number	beam angle (deg)	outer dim (mm)	height (mm)	optical finish	optical finish 2	attach method
Nata	3990-E	24	75	43	diffuse	super facet	none
Nata	3991-E	36	75	43	diffuse	super facet	none
Nata	3993-E	40	85	50.5	diffuse	super facet	none
Nata	2-1050A	25	65	44	satin	none	XSA242
Nata	2-1131E	18	68	51	m-diffuse	facets	XSA242
Nata	2-1132E	30	68	51	m-diffuse	super facet	XSA242
Nata	2-1133E	45	68	51	m-diffuse	super facet, flare	XSA242
Nata	4-1150E5	39	111	65	m-diffuse	super facet	none
Nata	4-1405E	16	98	66.4	specular	facets	none
Nata	4-1406E				diffuse	super facet	none
Nata	2-1535E				m-diffuse	super facet	none
Nata	4-1536E	20	110	65.3	m-diffuse	super facet	none
Nata	4-1537E	30	110	62	diffuse	super facet	none
Nata	4-1664E	24	111	65	m-diffuse	super facet	none / 3 tabs
Nata	4-1666E	38	111	65	diffuse	super facet	none / 3 tabs
Nata	4-1667E	45	111	61.3	m-diffuse	super facet	none
Nata	4-1820E	60	111	65	diffuse	super facet	none / 3 tabs
Nata	3-1901M	28	79	51	m-diffuse	super facet	XSA242
Nata	3-1903M	40	79	51	m-diffuse	super facet	XSA242
Nata	4-1966E	7	111	65	m-diffuse	super facet	XSA242
Widegerm	1009T-XC	38	49	30.5	specular	faceted	XSA242
Widegerm	1010T-XC	55	50	30.5	specular	none, trumpet	XSA242
Widegerm	208x-XM		71.5	54	satin	lightfaceted	XSA242
Widegerm	2201T-XM	19	72	44	m-diffuse	faceted	XSA242
Widegerm	2202T-XM	35	72	44	m-diffuse	faceted	XSA242
Widegerm	3150T-XM	17	75	48	m-specular	faceted	XSA242
Widegerm	3204T-XM	27	82	46	m-diffuse	faceted	XSA242
Widegerm	3205T-XM	36	82	46	specular	faceted	XSA242
Widegerm	3207T-XC	-	82	46	satin	none	XSA242
Widegerm	4219T-XM	20	111	36	diffuse	faceted	XSA242
Widegerm	4220T-XM	37	111	36	m-specular	faceted	XSA242
Widegerm	4221T-XM	47	111	36	m-specular	faceted	XSA242
Widegerm	4301T-XM	36	111	69	m-diffuse	faceted	XSA242
Widegerm	4401T-XM	43	111	69	m-diffuse	faceted	XSA242

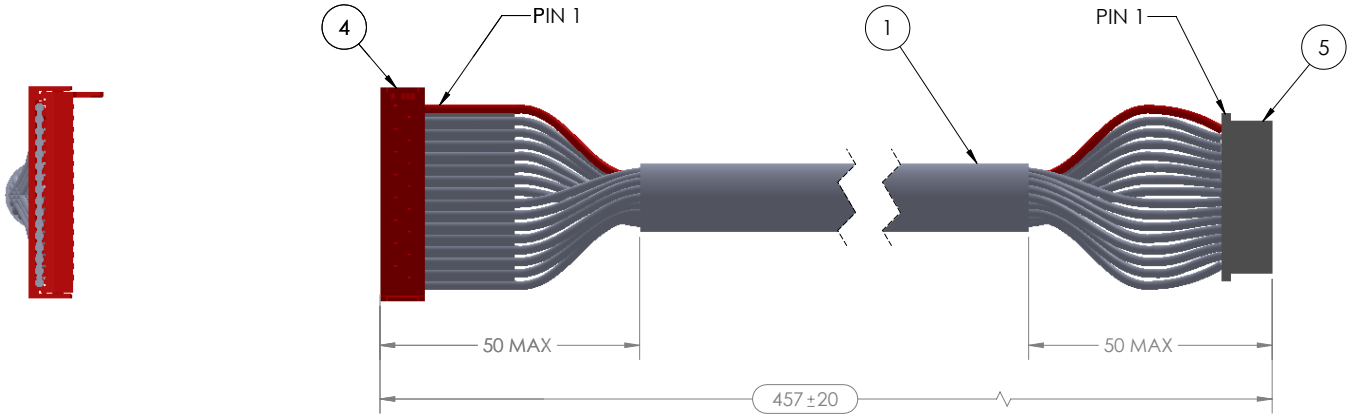
NOTE: Reflectors have been recommended based on independent optical tests conducted by Lumenetix, and should be used as guidelines.
Final reflector evaluation should be made by fixture manufacturers with all optics in place.

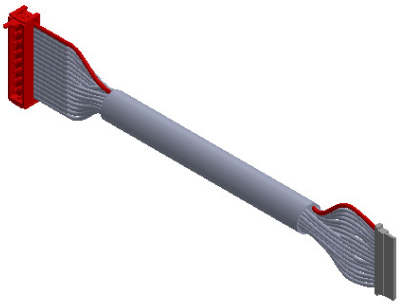
12 RIBBON CABLE ASSEMBLIES

12.1 Jacketed / Round 16-Pin Ribbon Cable (Nominal 18" Length)

Lumenetix part #:
28.700.003.03

16-pin Tyco Connector at one end, 20-pin JST connector at other end; for connecting ALM to round array.





Note: All dimensions are in millimeters.

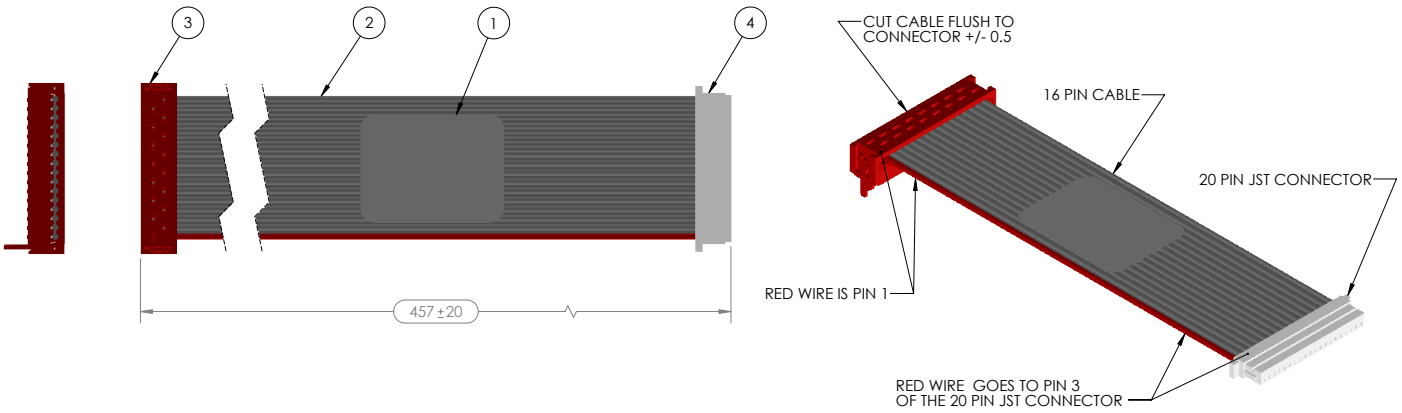
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	3M ROUND JACKED FLAT CABLE	3M ROUND JACKED FLAT CABLE 3759/16	1
2	CRIMP SSHL-003T-P0.2		16
4	16 PIN CONNECTOR c-1-215083-6-t-3d	CONNECTOR 16 PIN 1-215083-6	1
5	JST-SHLP-16V-S-B		1

12 RIBBON CABLE ASSEMBLIES

12.2 Flat 16-Pin Ribbon Cable (Nominal 18" Length)

Lumenetix part #:
28.700.001.05

16-pin Tyco Connector at one end, 20-pin JST connector at other end; for connecting ALM to round array.



Note: All dimensions are in millimeters.

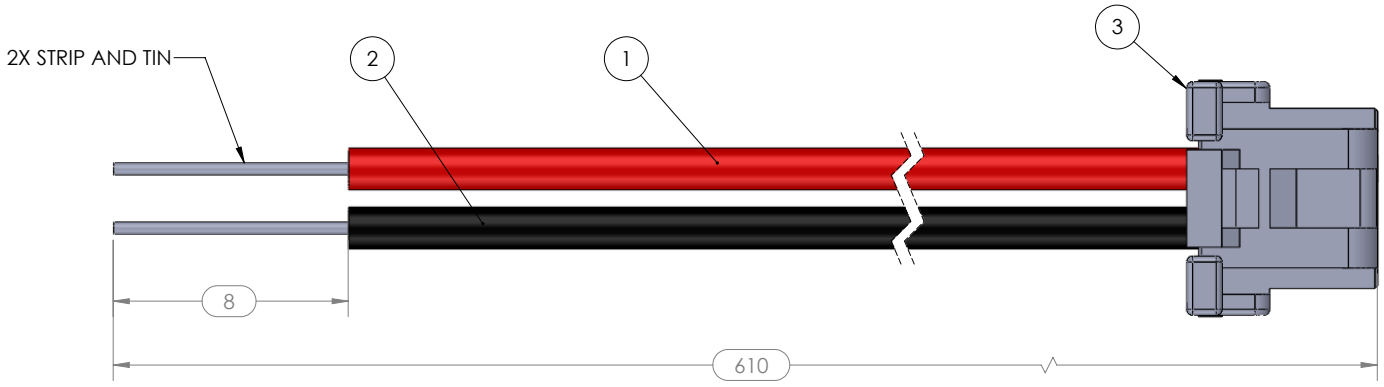
1	LABEL, LUMENETIX, PART#, DESCRIPTION, REVISION	1
2	16 PIN RIBBON CABLE 3M 3365-16	1
3	16 PIN CONNECTOR c-1-215083-6-t-3d	1
4	460.042 CONNECTOR SHR-20V-S-B	1
5	CRIMP SSH-003T-PO-2	16

13 POWER / CONTROL CABLE ASSEMBLIES

13.1.1 Power Cable Assembly (Nominal 24" Length)

Provides power to each module.

Lumenetix part #: 28.030.001.01



Note: All dimensions are in millimeters.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	RED WIRE 24AWG	HOOK -UP WIRE STRANDED 7/32 24AWG RED	1
2	BLACK WIRE 24AWG	HOOK -UP WIRE STRANDED 7/32 24AWG BLACK	1
3	CONNECTOR MOLEX 5023510200		1
4	CRIMP MOLEX 0503728000		2

12.1.2 Pin Allocation Chart for Power Cable Assembly

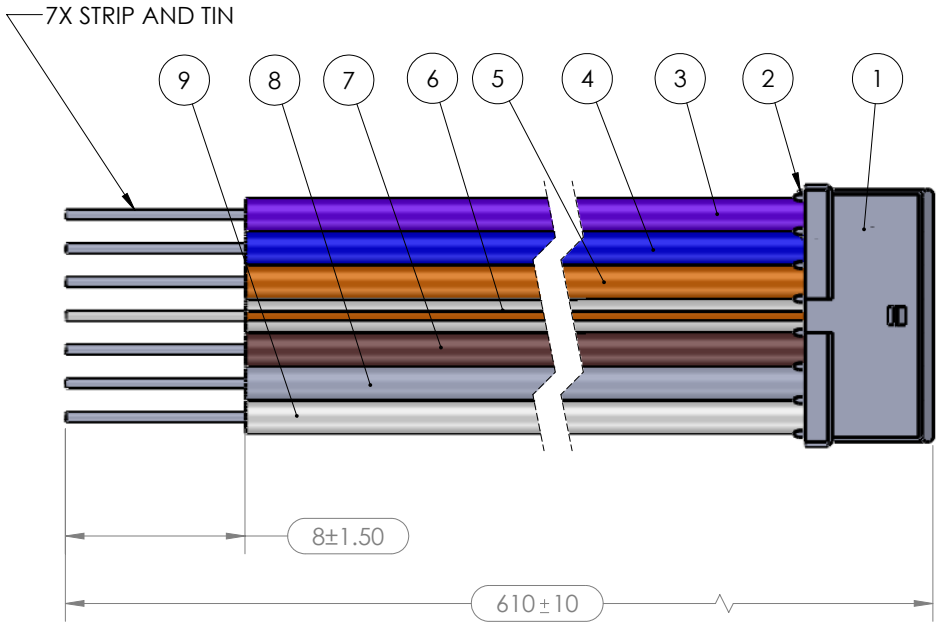
Pin #	Lead Color	Input
Pin 1	Red	Power 24V DC (+)
Pin 2	Black	Power Common (-)

13 POWER / CONTROL CABLE ASSEMBLIES

13.2.1 Control Cable Assembly (Nominal 24" Length)

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

Lumenetix part #: 28.002.002.01



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

Note: All dimensions are in millimeters.

12.2.2 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	DMX Data (-)
Pin 4	White with orange stripe	DMX Data (+)
Pin 5	Brown	Digital Common
Pin 6	Gray	0-10V Dimming (-)
Pin 7	White	0-10V Color (-)

14 WIRING DIAGRAMS

14.1 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

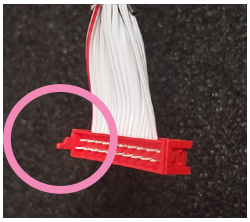
Vantage

Wattstopper

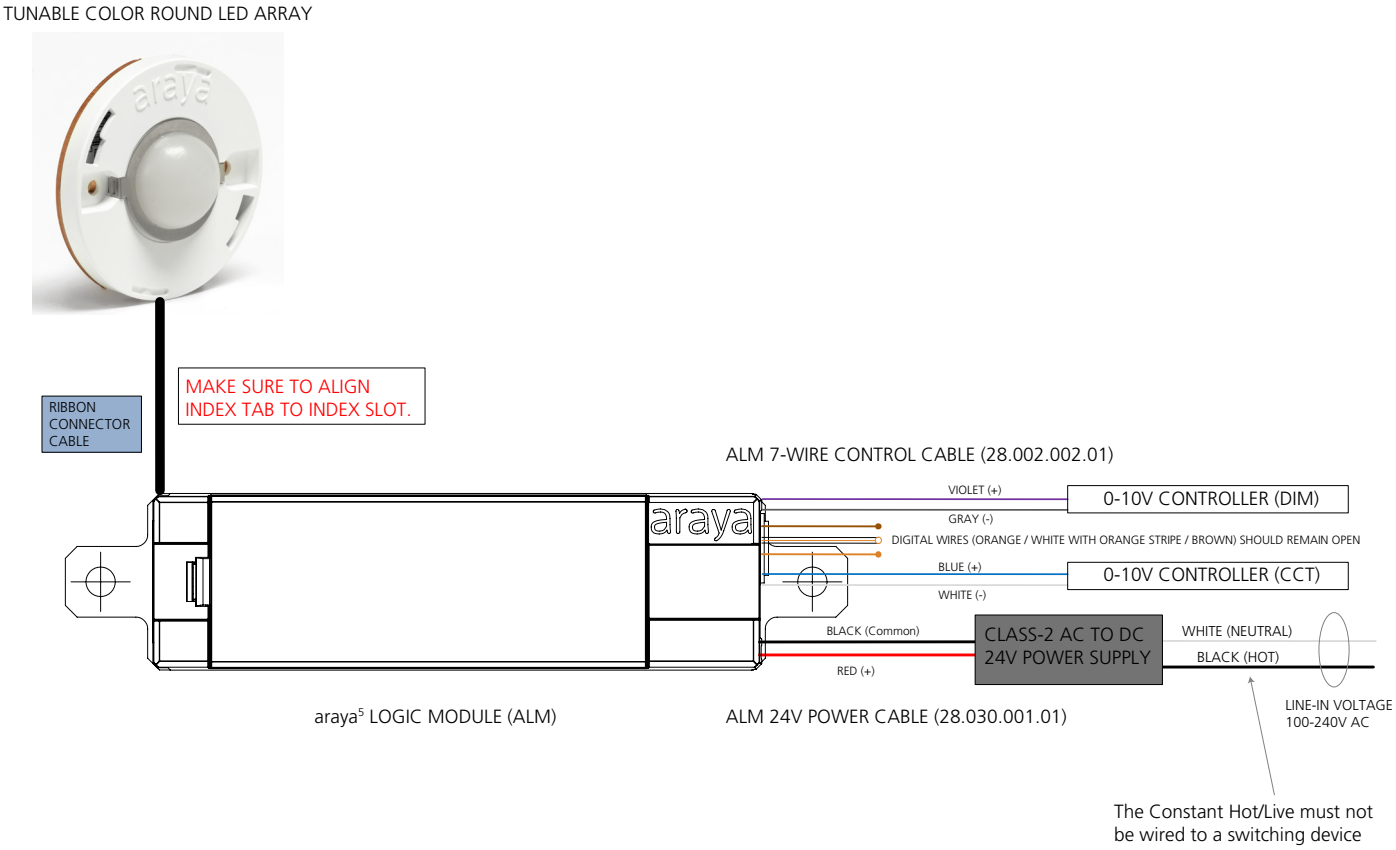
*Recommendations are subject to change. Consult your Lumenetix representative for the most updated list.

14 WIRING DIAGRAMS

14.1.1 0-10V Wiring Diagram

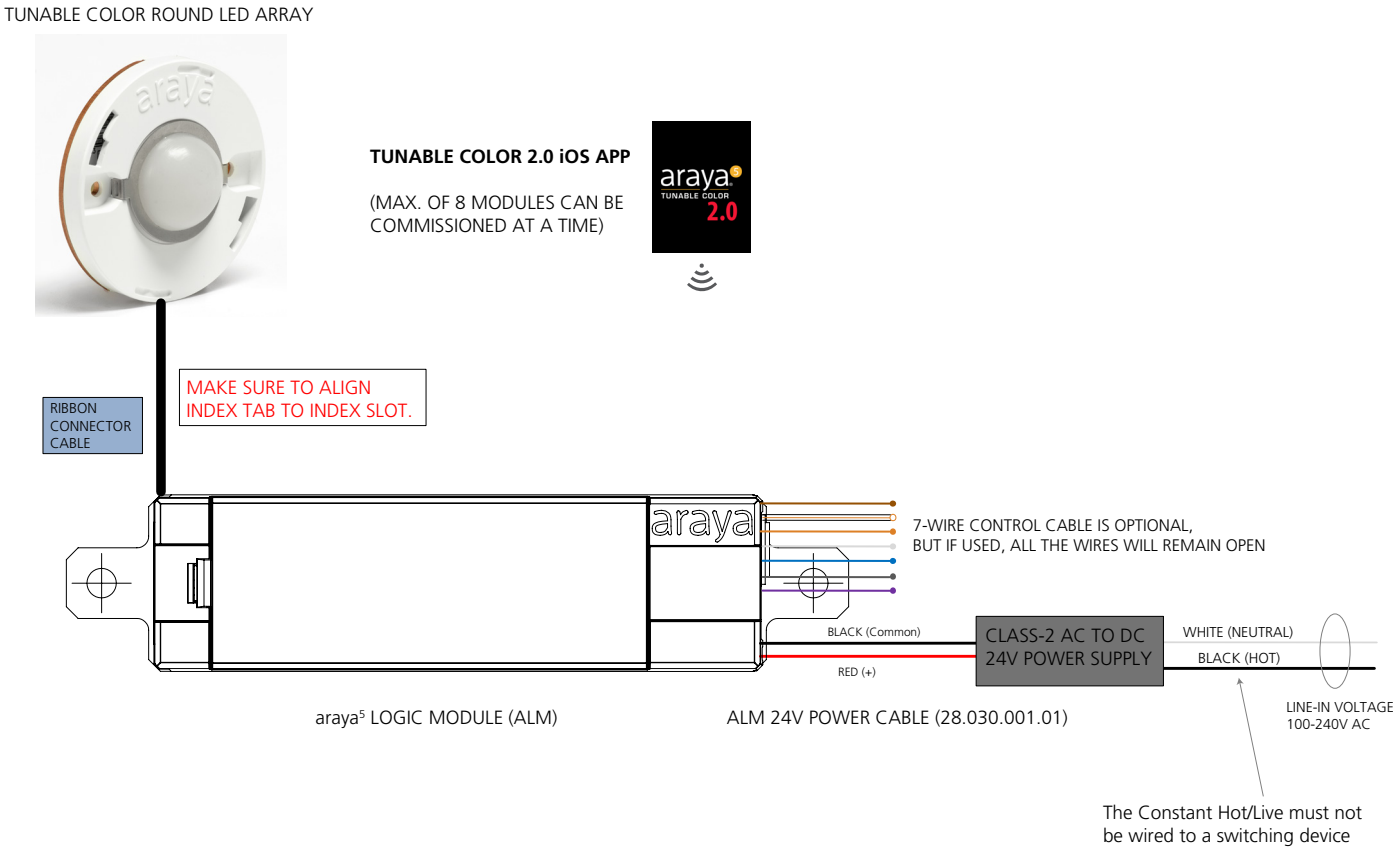


INDEX TAB ON RED END OF CABLE CONNECTOR SHOULD LINE UP WITH INDEX SLOT ON ALM.



14 WIRING DIAGRAMS

14.2 Bluetooth Operation using the araya® Tunable Color 2.0 iOS App



NOTE: BLUETOOTH OPERATION IS FOR COMMISSIONING THE MODULES ONLY, NOT FOR CONTROLLING THEM.

14 WIRING DIAGRAMS

14.3 DMX512-A-RDM 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 araya[5] 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 (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 araya[5] 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 araya[5] 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 araya[5] modules connected to the board.

Default DMX512-A Slot Allocation:

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

14 WIRING DIAGRAMS

14.3.1 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	$3KV_{rms}$	

DMX512-A Control Systems (recommended list)

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

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

14 WIRING DIAGRAMS

14.3.2 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.

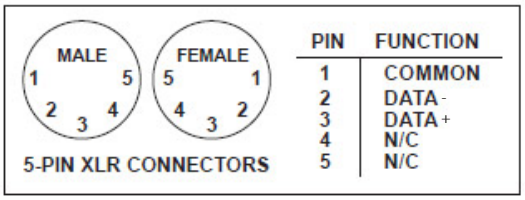
DMX512-A Recommended Field Connectors

Use only approved connectors.

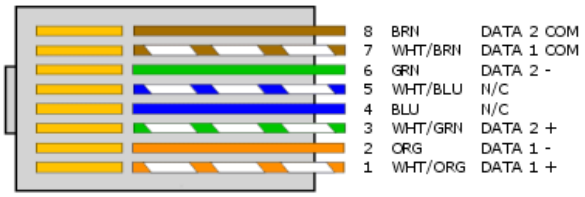
DMX512-A Wiring Connections

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

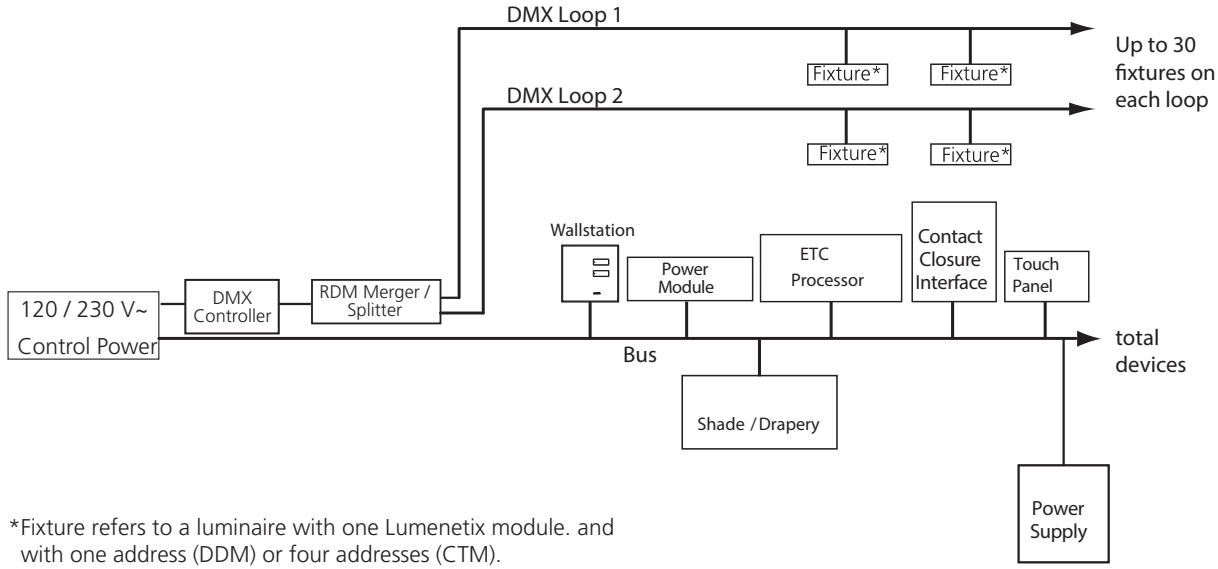
XLR Connectors (5-Pin)



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).

14 WIRING DIAGRAMS

14.3.3 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

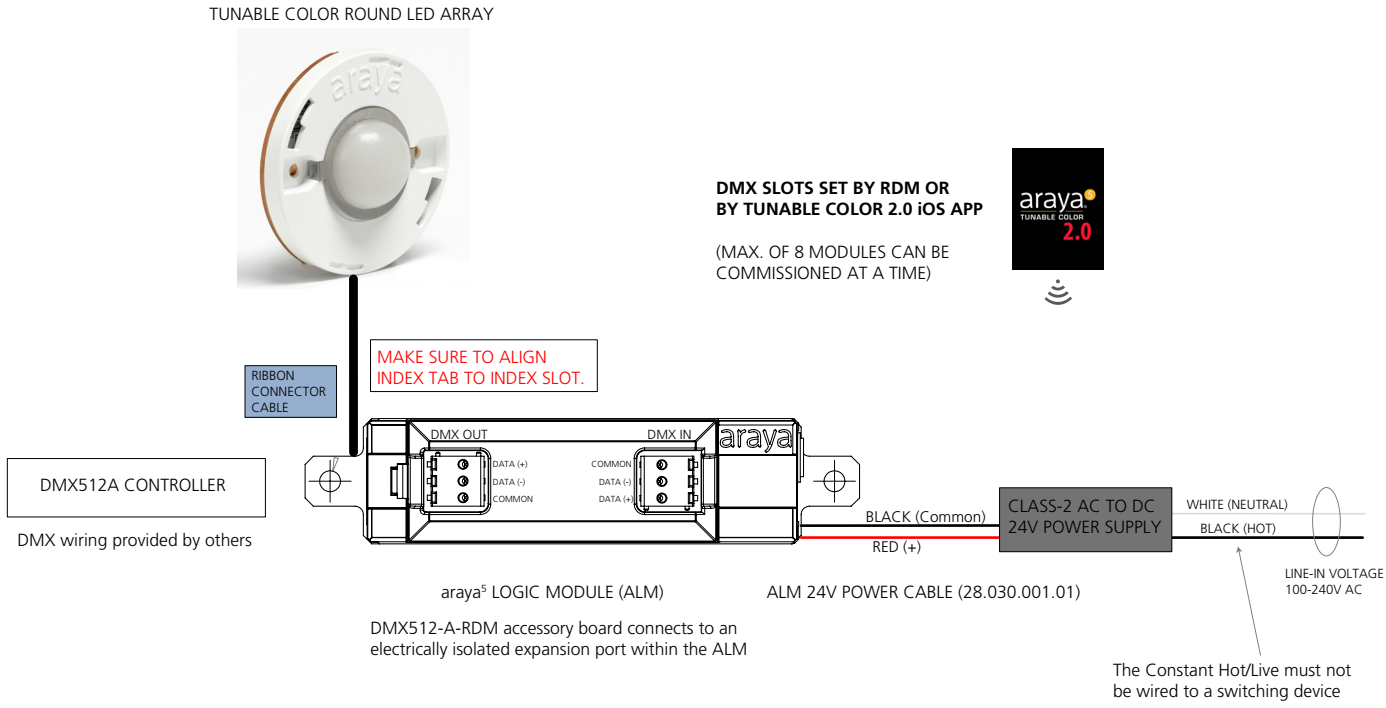
A typical two-pair shielded cable can be prepared for termination to the terminals with the drain wire cut off. The drain wire, which is an uninsulated conductor, is sleeved with a insulating tubing to prevent accidental grounding. The crimp-on lug is valuable in this instance to retain the tubing. Insulating 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.

14 WIRING DIAGRAMS

14.3.4 DMX512-A-RDM Accessory Card Wiring Diagram

Notes:

1. 24V power (red/black) is Class-2 rated.
2. Adapter is configured at factory for DMX inputs.



NOTE: BLUETOOTH OPERATION IS FOR COMMISSIONING THE MODULES ONLY, NOT FOR CONTROLLING THEM.

14 WIRING DIAGRAMS

14.4 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 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

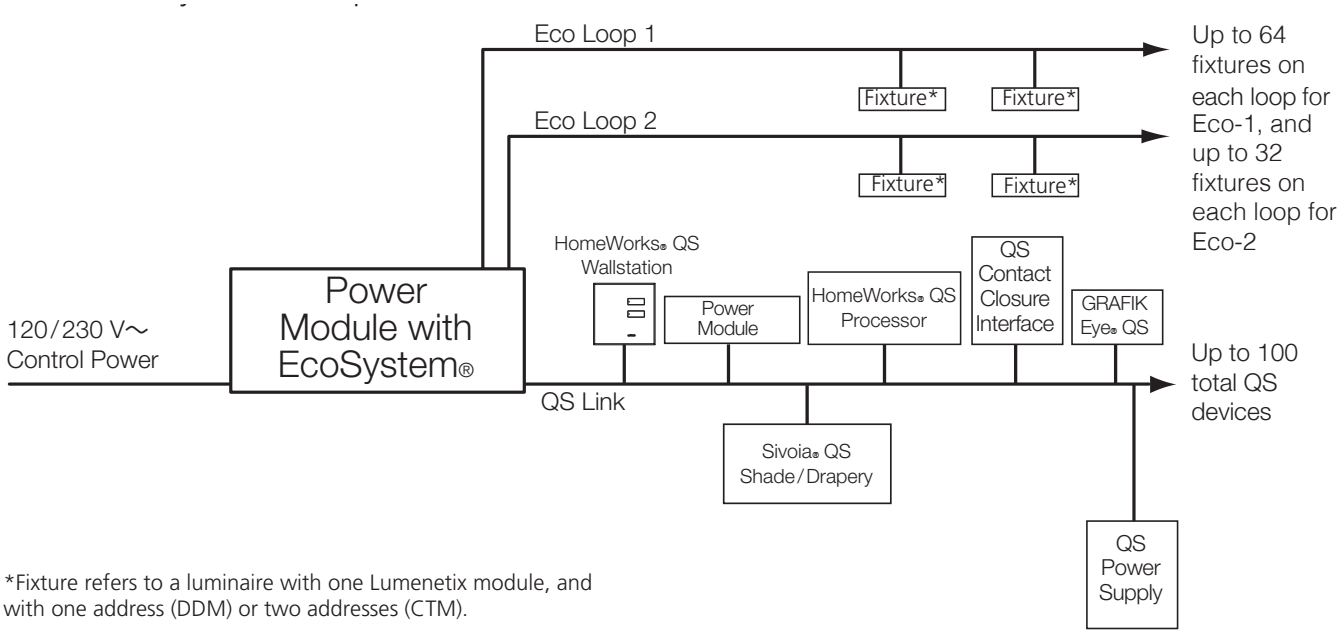
EnergiSavr Node with EcoSystem

Power Module with EcoSystem

PowPak RMJ-ECO-32-DV-B

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

Lutron EcoSystem Controller Example



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

14 WIRING DIAGRAMS

14.4.1 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 mm² (12 AWG)	671 m (2200 ft)
2.5 mm² (14 AWG)	427 m (1400 ft)
1.5 mm² (16 AWG)	275 m (900 ft)
1.0 mm² (18 AWG)	175 m (570 ft)

14.4.2 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.

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Method-2

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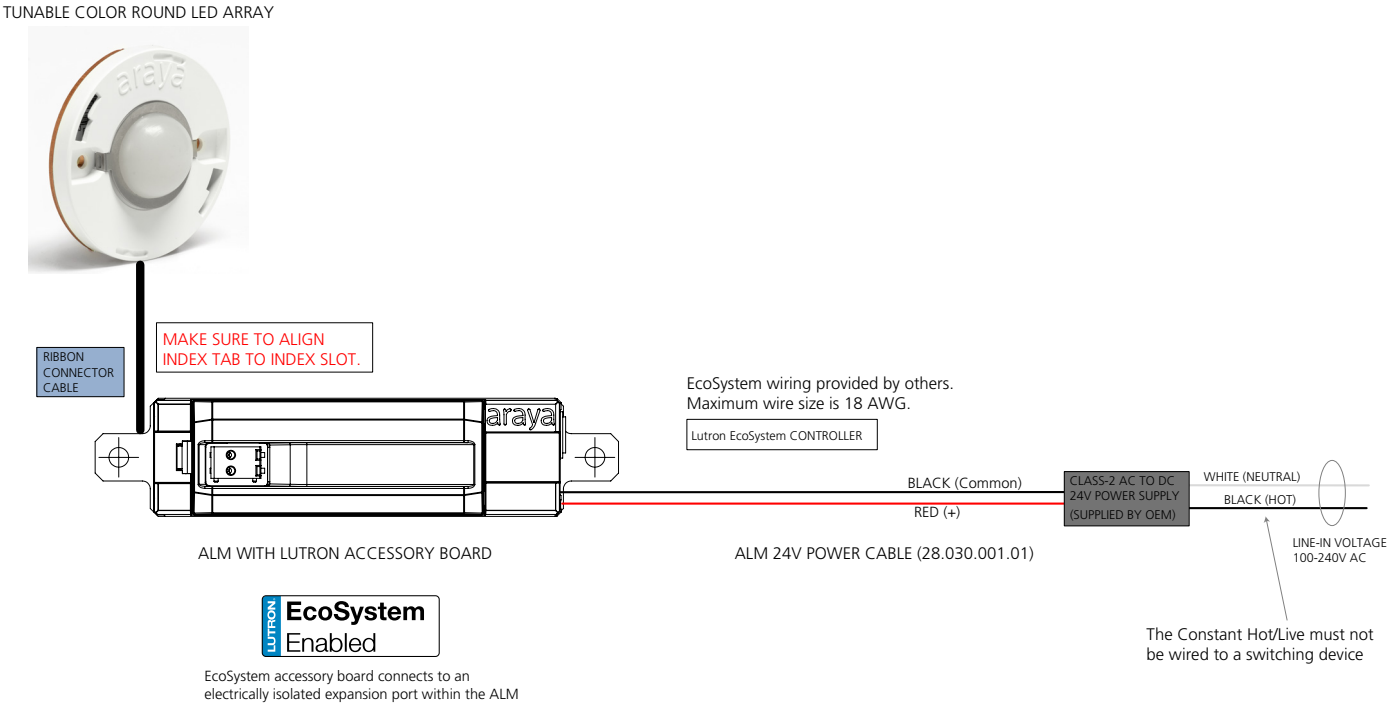
14 WIRING DIAGRAMS

14.4.3 Lutron® EcoSystem Accessory Card Wiring Diagram

Notes:

1. 24V power (red/black) is Class-2 rated.
2. EcoSystem Channel 1 is always Intensity control. EcoSystem Channel 2 is always CCT control.
3. In the EcoSystem programming mode, EcoSystem Channel 1 controls the intensity from 100%-1%. EcoSystem Channel 2 controls the CCT range from 1650 - 8000K.



15 PRE-INSTALLATION NOTES

TUNABLE COLOR ROUND LED ARRAYS

- **Exercise caution** when connecting the ribbon cables to the LED arrays. Do not press the domed lens against a hard surface (like a table or workbench) as they can be damaged. Do not break off the indexing tabs.

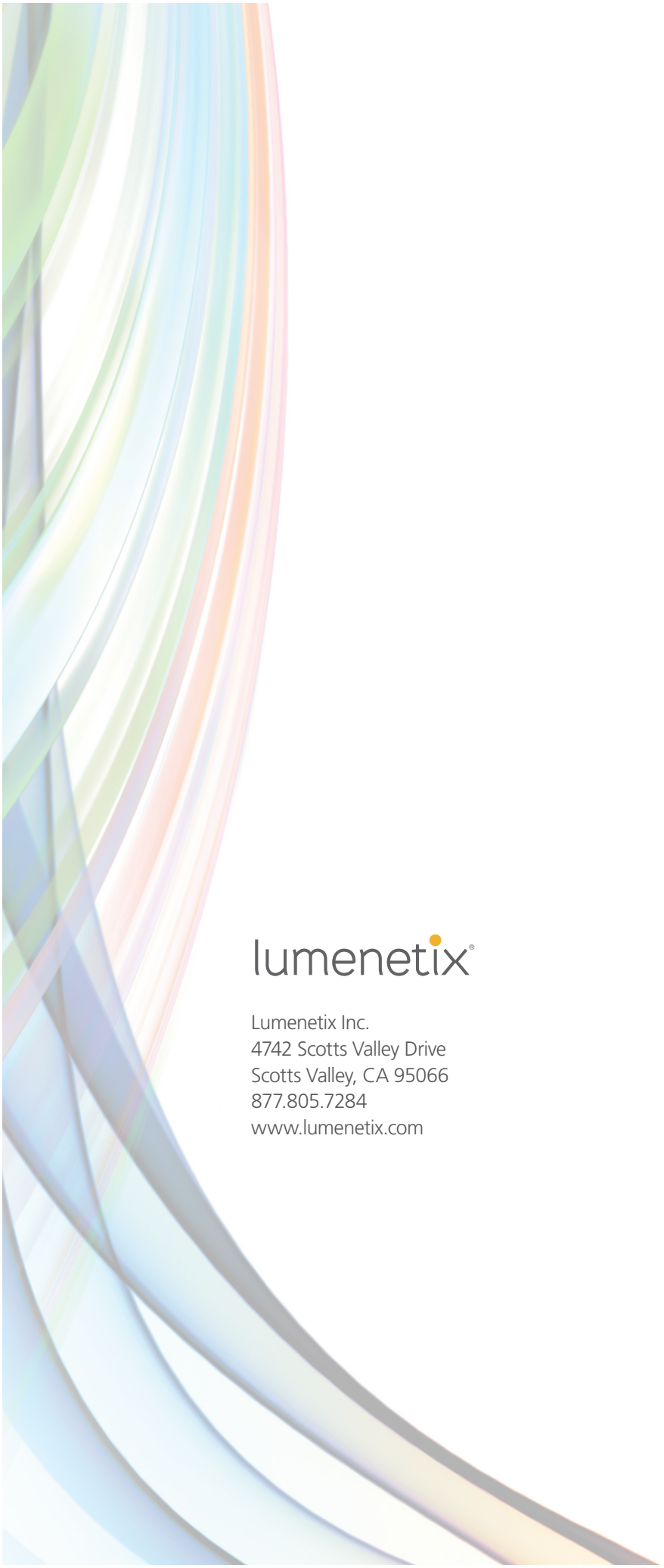
RIBBON CABLE CONNECTORS

- The ribbon cable connector slot is located on one side of the round LED array.

araya5 LOGIC MODULE

- Mount the araya5 Logic Module to the fixture with 6 mm - 8 mm (M2.5 - M4) screws in desired location.

Test-fit all components prior to installation. Mark edges for correct alignment.



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