

# APT-CV2-VX-SQ MODULES



## Features

- > APT-CV2 controllers add advanced control features to standard constant voltage (CV) drivers
- > Integrated between the CV driver and LED modules, the DC modules are powered directly from the CV driver
- > APT-CV2 controllers provide up to 2 constant current outputs for powering LED channels of varying forward voltages
- > Operable for independent control over each output channel and/or control over overall intensity and CCT
- > APT Programmer enables in-factory and in-field changes to control settings including CCT range, CCT mapping and Intensity mapping
- > Wired versions available with DMX512/RDM (VA), DALI-2 DT8 (VB), 2x isolated 0-10V ports (VC), or 2x non-isolated 0-10V ports (VD)
- > Wireless versions available (VWx) with Casambi BLE Mesh or Silvrair BLE Mesh
- > Wireless controller versions available with either embedded antenna (EA) or whip antenna (WA)

## Ordering Information

Product Code	Description
<b>APT-CV2-Vx-SQ-wwwww</b>	<b>Vx</b> – Hardware version <b>SQ</b> – Square form factor <b>wwwww</b> – Internal code provided by Arkalumen as a simplified configuration code for repeat orders

Hardware Version	Functionality
VA	DMX512/RDM
VB	DALI-2 DT8
VC	0-10V (Isolated)
VD	0-10V (Non-isolated)
VWx	Wireless – BLE Mesh

## System Architecture

Design Requirements	
1.	Ensure DC $V_{IN}$ is greater than $V_{OUT}$ of each channel (dictated by the LED forward voltage of the channel).
2.	If optimized transition is desired, use transition calibration feature in the advanced tab of the APT Programmer
3.	Minimize $\Delta V$ of each channel for optimal efficiency. $\Delta V_{MAX}$ is determined based on the channel current ( $I_{CH}$ ). For $I_{CH} < 1.0A$ , $\Delta V_{MAX} = 15V$ For $1.0A < I_{CH} < 2.0A$ , $\Delta V_{MAX} = 10V$ For $2.0A < I_{CH} < 2.5A$ , $\Delta V_{MAX} = 6.0V$ For $2.5A < I_{CH} < 3.2A$ , $\Delta V_{MAX} = 3.5V$
4.	LED channels should be able to handle a minimum of 80mA ripple. 80mA ripple is seen with the following conditions, 1.2A/channel and 1.2V $\Delta V$ . Current ripple is dependent on $\Delta V$ of each channel.
5.	APT controllers are designed to work with a wide range of drivers, but a fixture manufacturer must test the APT controller for driver compatibility and ensure proper system operation before installation.

Contact Arkalumen for technical support at [support@arkalumen.com](mailto:support@arkalumen.com)

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## Warnings

1. Do not connect/disconnect input or output wiring while powered
2. Do not connect APT Programmer while APT controller is powered by DC power source
3. Follow ESD protection procedures while handling input or output wiring, and programming port
4. Do not attach an AC input to the APT controller; DC input only
5. Use only with a driver providing an isolated DC output (ie. the output has no earth or protective ground reference).
6. Read and respect all voltage, current and power limits outlined in the electrical specifications section of the hardware version being used
7. Carefully follow and check all wiring diagrams in this document for the correct hardware version being used

## Operating Conditions

Environmental	
Ambient Temperature, Range	-40 to +50°C
Material	Plastic

## Mechanical Specifications

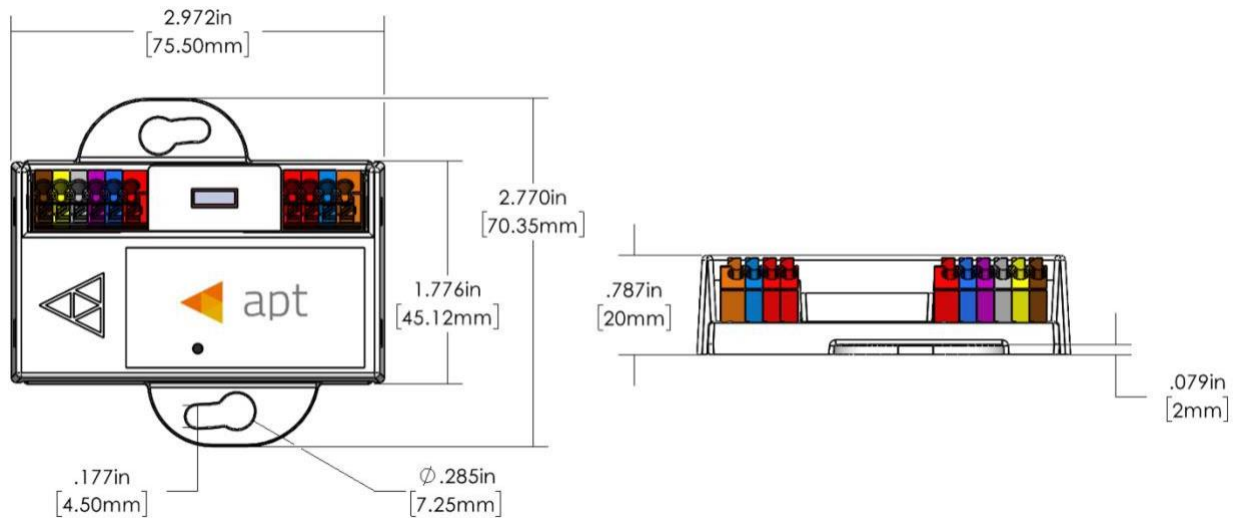


Figure 1 - APT-CV2-Vx-SQ Mechanical Drawing

Dimensions	Inches
Length	2.97
Width	2.77
Height	0.79

# APT-CV2-VA-SQ MODULE (DMX512/RDM)

## Electrical Specifications

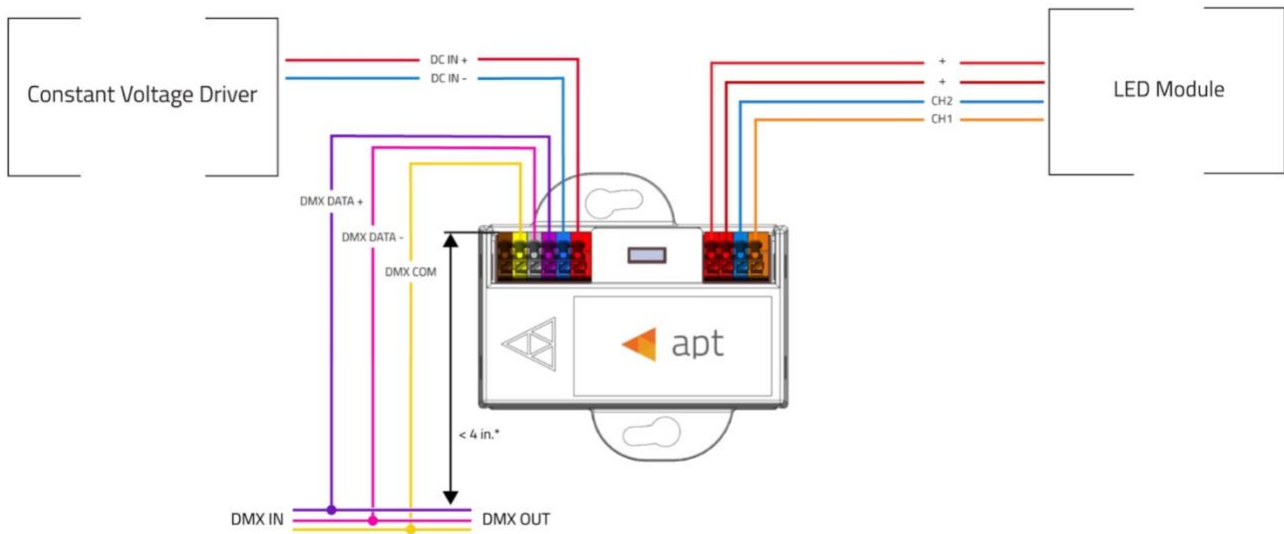
### Input

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
DC IN +/-	12	60	V	65	4,100	mA	-	100	W
DMX Data+	-10	15	V	-0.8	1	mA	-	-	-
DMX Data-	-10	15	V	-0.8	1	mA	-	-	-

### Output

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
+	-	58	V	0	4,035	mA	-	100	W
CH1	-	58	V	0	3,200	mA	-	-	-
CH2	-	58	V	0	3,200	mA	-	-	-

## Wiring Diagram



\*If no DMX splitter or amplifier is used, splitting between DMX IN/OUT should be done within 4 inches of the APT controller input connector to prevent line reflectance.

Figure 2 - APT-CV2-VA-SQ DMX512/RDM Configuration

1. Please follow all best practices for DMX wiring to ensure correct operation of the system such as using shielded wires and proper termination resistance for DMX daisy chain.
2. APT controller acts as a floating device as per ANSI E1.11 – 2008. Use only with a driver with an output not referenced to earth or protective ground (ie. isolated output).
3. It is recommended that each fixture should have DMX IN and DMX OUT wires to allow for installation in a DMX daisy chain\*.  
*\*Exception for installations where a splitter or amplifier will be used for each DMX branch*
4. If no DMX splitter or amplifier is used, splitting between DMX IN/OUT should be done within 4 inches of the APT controller input connector to prevent line reflectance.

Wiring	AWG
Input, Output	16-22

#### INPUT, OUTPUT, EARTH



#### DMX Address Assignment

Enabled Features	Required DMX Channels
Independent Channel Control	One DMX address is required per available output channel
Calibrated CCT Control	Two additional DMX addresses are required if calibrated CCT mapping is enabled, one for controlling the CCT and one for controlling the overall light intensity

#### Schemes

Scheme <i>n</i>	# of DMX Addresses	DMX Address			
		Base	+1	+2	+3
1	2	CCT	INT	-	-
2	2	WW	CW	-	-
3	4	CCT	INT	WW	CW
4	4	WW	CW	CCT	INT

Legend			
Warm White	WW	CCT Control	CCT
Cool White	CW	Intensity Control	INT

1. The assigned DMX addresses are customizable. The above table is a list of the default schemes available.
2. Changing the DMX Address Assignment does not change the physical wiring of the controller to the LED module. Please refer to Figure 3 for warm white/cool white wiring application.

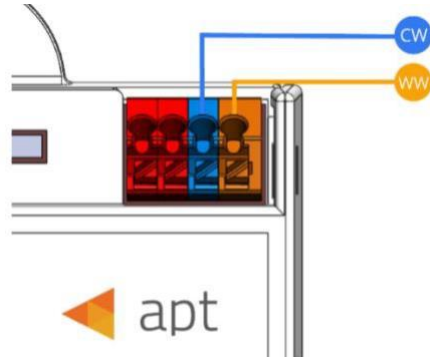


Figure 3 - Wiring APT-CV2-VA-SQ to Warm White/Cool White LED module

### Ordering Information

Product Code	Description
<b>APT-CV2-VA-SQ-wwww</b>	<b>VA</b> – DMX512/RDM hardware version <b>SQ</b> – Square form factor <b>wwww</b> – Internal code provided by Arkalumen as a simplified configuration code for repeat orders

Configuration Code	Description
<b>DMXn-Ammm-tttt-1Cxxx-2Cxxx</b>	<b>DMXn</b> – DMX Address Assignment Scheme <b>Ammm</b> – Base DMX address <b>tttt</b> – Output control feature <b>yCxxx</b> – Channel-specific max current

Code	Description	Option	Configuration Trait
<b>DMXn</b>	<b>DMXn</b> denotes DMX wired communication using DMX Address Assignment Scheme <i>n</i> .	<b>DMXn</b>	DMX Address Assignment Scheme <i>n</i> . See Schemes under DMX Address Assignment on page 4.
<b>Ammm</b>	<b>mmm</b> denotes the base address of the controller on a DMX bus.	<b>A001</b>	Lowest base address option
		<b>A###</b>	Base address specified between 1 and 512
		<b>A512</b>	Highest base address option
<b>tttt</b>	<b>tttt</b> denotes the output control features enabled on the controller.	<b>0000</b>	Calibrated CCT mapping disabled
		<b>CALC</b>	Calibrated CCT enabled. Calibrated CCT can be customized to output specific desired light metrics.
<b>yCxxx</b>	<b>yCxxx</b> denotes the maximum current for channel <i>y</i> as configured in the controller's firmware in 20mA increments.	<b>1C###</b>	Maximum current specified up to 3,200mA. e.g. -1C200-2C200 would specify 2000mA max current for channel 1 and 2.
		<b>2C###</b>	

# APT-CV2-VB-SQ MODULE (DALI-2 DT8)

## Electrical Specifications

### Input

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
DC IN +/-	12	60		10	4,100		-	100	
DALI DA	-6.5	22.5		-	2		-	-	
DALI DA	-6.5	22.5		-	2		-	-	

### Output

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
+	-	58		0	4,090		-	100	
CH1	-	58		0	3,200		-	-	
CH2	-	58		0	3,200		-	-	

## Wiring Diagram

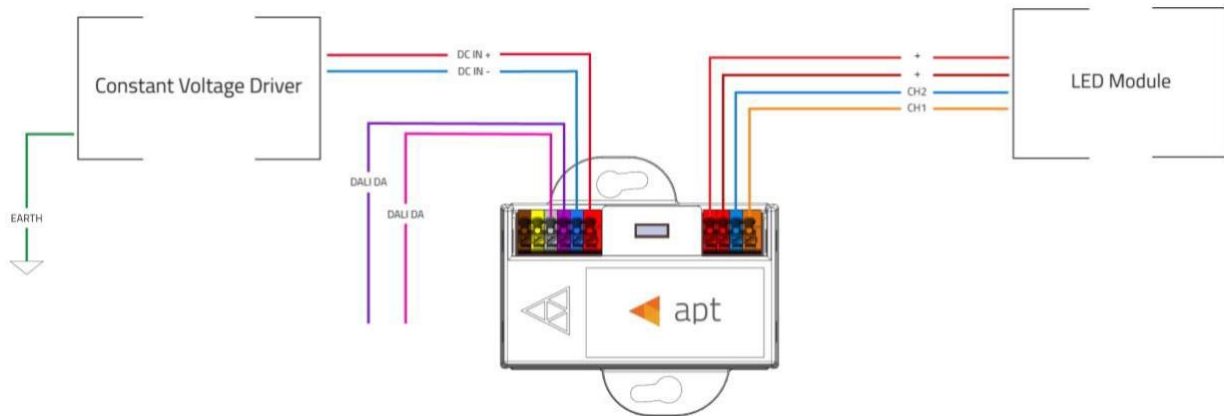
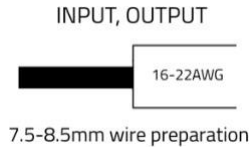


Figure 4 - APT-CV2-VB-SQ DALI-2 DT8 Configuration

Wiring	AWG
Input, Output	16-22



### Ordering Information

Product Code	Description
<b>APT-CV2-VB-SQ-<i>wwwww</i></b>	<b>VB</b> – DALI hardware version <b>SQ</b> – Square form factor <b><i>wwwww</i></b> – Internal code provided by Arkalumen as a simplified configuration code for repeat orders

Configuration Code	Description
<b>DALI-0000-<i>tttt</i>-1C<i>xxx</i>-2C<i>xxx</i></b>	<b>DALI</b> – DALI-2 DT8 Control <b>0000</b> – No base address to be specified <b><i>tttt</i></b> – Output control feature <b><i>yCxxx</i></b> – Channel-specific max current

### Configuration Code Details

Code	Description	Option	Configuration Trait
<b><i>tttt</i></b>	<b><i>tttt</i></b> denotes the output control features enabled on the controller.	<b>0000</b>	Calibrated CCT mapping disabled
		<b>CALC</b>	Calibrated CCT enabled. Calibrated CCT can be customized to output specific desired light metrics.
<b><i>yCxxx</i></b>	<b><i>yCxxx</i></b> denotes the maximum current for channel <b><i>y</i></b> as configured in the controller's firmware in 20mA increments.	<b>1C###</b>	Maximum current specified up to 3,200mA. e.g. -1C200-2C200 would specify 2000mA max current for channel 1 and 2.
		<b>2C###</b>	

# APT-CV2-VC-SQ MODULE (0-10V ISOLATED)

## Electrical Specifications

### Input

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
DC IN +/-	12	60	V	75	4,100	mA	-	100	W
0-10V IN1/IN2 (Sink)	0	20	V	98	104	μA	-	-	-
0-10V IN1/IN2 (Source)	0	20	V	0	300	μA	-	-	-

### Output

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
+	-	58	V	0	4,025	mA	-	100	W
CH1	-	58	V	0	3,200	mA	-	-	-
CH2	-	58	V	0	3,200	mA	-	-	-

## Wiring Diagram

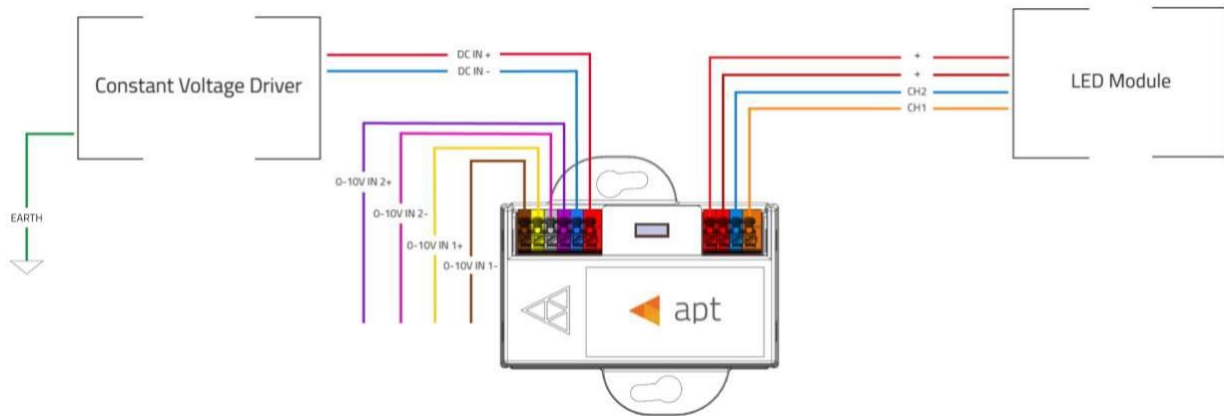


Figure 5 - APT-CV2-VC-SQ Dual 0-10V Dimmer Configuration



Wiring	AWG
Input, Output	16-22

INPUT, OUTPUT



7.5-8.5mm wire preparation

Ordering Information

Product Code	Description
APT-CV2-VC-SQ- <i>wwwww</i>	<b>VC</b> – Isolated 0-10V hardware version <b>SQ</b> – Square form factor <b>wwwww</b> – Internal code provided by Arkalumen as a simplified configuration code for repeat orders

Configuration Code	Description
<i>nnnn-0000-tttt-1Cxxx-2Cxxx</i>	<b>nnnn</b> – IN1/IN2 port control features <b>0000</b> – No base address to be specified <b>tttt</b> – Output control feature <b>yCxxx</b> – Channel-specific max current

Code	Description	Option	Configuration Trait
<i>nnnn</i>	<i>nnnn</i> denotes the control features assigned to each IN port.	<b>IN00</b>	Intensity control enabled on IN2 port.
		<b>CICI</b>	Independent channel control enabled.
		<b>INCT</b>	Intensity control enabled on IN2 port and CCT control enabled on IN1 port.
<i>tttt</i>	<i>tttt</i> denotes the output control features enabled on the controller.	<b>0000</b>	Calibrated CCT mapping disabled.
		<b>CALC</b>	Calibrated CCT enabled. Calibrated CCT can be customized to output specific desired light metrics.
<i>yCxxx</i>	<i>yCxxx</i> denotes the maximum current for channel <i>y</i> as configured in the controller's firmware in 20mA increments.	<b>1C###</b>	Maximum current specified up to 3,200mA.
		<b>2C###</b>	e.g. -1C200-2C200 would specify 2000mA max current for channel 1 and 2.

# APT-CV2-VD-SQ MODULE (0-10V NON-ISOLATED)

## Electrical Specifications

### Input

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
DC IN +/-	12	60	V	10	4,100	mA	-	100	W
0-10V IN1/IN2 (Sink)	0	12	V	0	90	μA	-	-	-
0-10V IN1/IN2 (Source)	0	12	V	0	700	μA	-	-	-

### Output

Port	Voltage		V	Current		mA	Power		W
	Min	Max		Min	Max		Min	Max	
+	-	58	V	0	4,090	mA	-	100	W
CH1	-	58	V	0	3,200	mA	-	-	-
CH2	-	58	V	0	3,200	mA	-	-	-

## Wiring Diagram

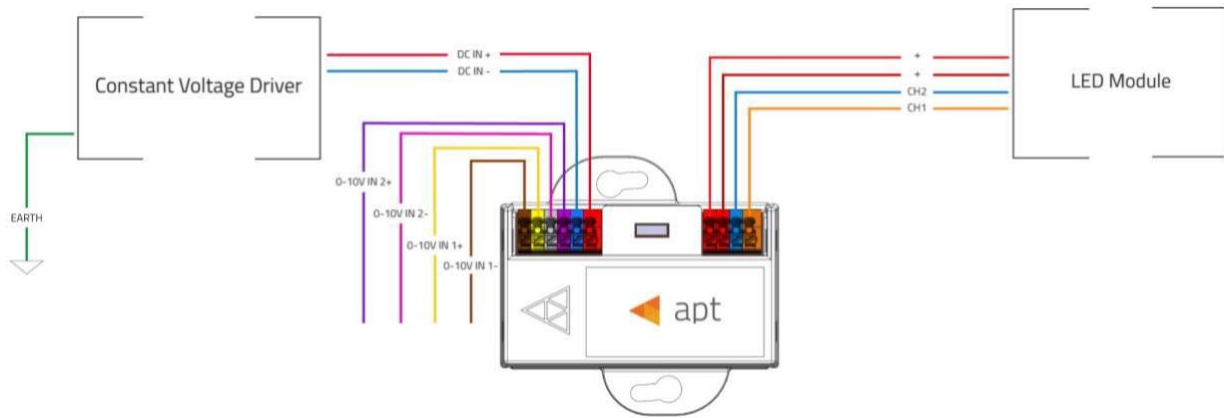
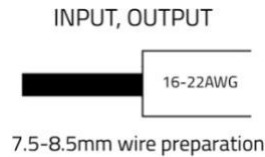


Figure 6 - APT-CV2-VD-SQ Dual 0-10V Dimmer Configuration

Wiring	AWG
Input, Output	16-22



### Ordering Information

Product Code	Description
<b>APT-CV2-VD-SQ-wwwww</b>	<b>VD</b> – Non-isolated 0-10V hardware version <b>SQ</b> – Square form factor <b>wwwww</b> – Internal code provided by Arkalumen as a simplified configuration code for repeat orders

Configuration Code	Description
<b>nnnn-0000-tttt-1Cxxx-2Cxxx</b>	<b>nnnn</b> – IN1/IN2 port control features <b>0000</b> – No base address to be specified <b>tttt</b> – Output control feature <b>yCxxx</b> – Channel-specific max current

Code	Description	Option	Configuration Trait
<b>nnnn</b>	<b>nnnn</b> denotes the control features assigned to each IN port.	<b>IN00</b>	Intensity control enabled on IN2 port.
		<b>CICI</b>	Independent channel control enabled.
		<b>INCT</b>	Intensity control enabled on IN2 port and CCT control enabled on IN1 port.
<b>tttt</b>	<b>tttt</b> denotes the output control features enabled on the controller.	<b>0000</b>	Calibrated CCT mapping disabled.
		<b>CALC</b>	Calibrated CCT enabled. Calibrated CCT can be customized to output specific desired light metrics.
<b>yCxxx</b>	<b>yCxxx</b> denotes the maximum current for channel <b>y</b> as configured in the controller's firmware in 20mA increments.	<b>1C###</b>	Maximum current specified up to 3,200mA. e.g. -1C200-2C200 would specify 2000mA max current for channel 1 and 2.
		<b>2C###</b>	

# APT-CV2-VWx-SQ MODULE (WIRELESS)

## Electrical Specifications

### Input

Port	Voltage		V	Current		mA	Power	
	Min	Max		Min	Max		Min	Max
DC IN +/-	12	60		42	4,100		-	100

### Output

Port	Voltage		V	Current		mA	Power	
	Min	Max		Min	Max		Min	Max
+	-	58		0	4,058		-	100
CH1	-	58		0	3,200		-	-
CH2	-	58		0	3,200		-	-

Wireless Operating Conditions <sup>1</sup>	
Maximum Transmitter Power	+4dBm
Operating Frequencies	2.4GHz
Maximum Open-Air Range	270m

Contains modular transmitter with FCC ID: X8WBM832, IC (Industrial Canada) ID: 4100A-BM832

Wireless signal range of the controller will decrease if placed in a metal enclosure or placed near other wireless devices operating at similar frequencies, keep the VWx controller at least 20cm away from other VWx controllers or wireless devices. The end product with this module may subject to perform FCC part 15 unintentional emission test requirement and be properly authorized.

This device is intended for OEM integrator only.

If used with ANT020 antenna or integrated PCB trace antenna, device does not require routine evaluation or SAR testing.

## Wiring Diagram

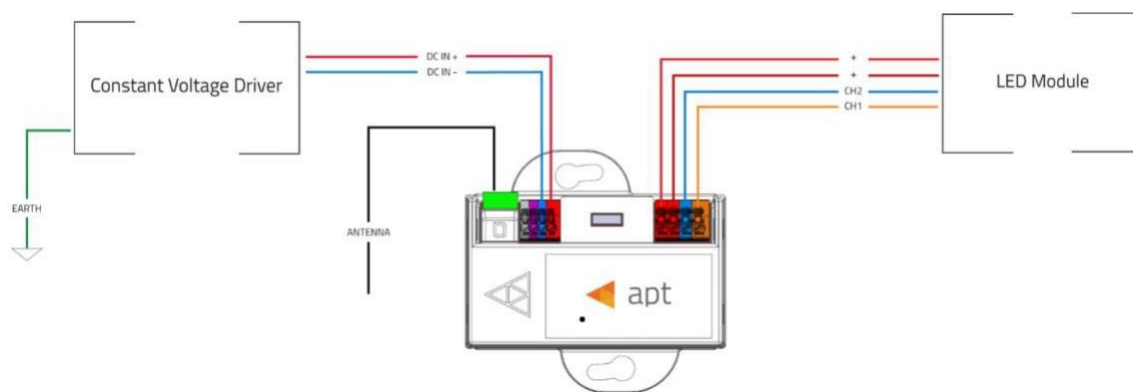
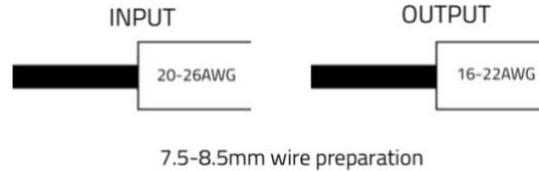


Figure 7 - APT-CV2-VWx-SQ Wireless Communication Configuration

Wiring	AWG
Input	20-26
Output	16-22
Antenna	ANT020*

\*Integrated embedded PCB trace antenna option available on request, ANT020 antenna does not come with device by default, please include request for antenna if necessary



### Ordering Information

Product Code	Description
<b>APT-CV2-VWx-SQ-yA-wwww</b>	<b>VWx</b> – Wireless - BLE Mesh hardware version (VWC – Casambi BLE, VWS – Silvair BLE) <b>SQ</b> – Square form factor <b>yA</b> – Antenna version (EA – embedded antenna, WA -whip antenna) <b>wwww</b> – Internal code provided by Arkalumen as a simplified configuration code for repeat orders

Configuration Code	Description
<b>nnn-0000-tttt-1Cxxx-2Cxxx</b>	<b>nnn</b> – Wireless control protocol <b>0000</b> – No base address to be specified <b>tttt</b> – Output control feature <b>yCxxx</b> – Channel-specific max current

### Configuration Code Details

Code	Description	Option	Configuration Trait
<b>nnn</b>	<b>nnn</b> denotes the wireless communication source implemented.	<b>CBM</b>	Wireless via Casambi BLE Mesh
		<b>SBM</b>	Wireless via Silvair BLE Mesh
<b>tttt</b>	<b>tttt</b> denotes the output control features enabled on the controller.	<b>0000</b>	Calibrated CCT mapping disabled.
		<b>CALC</b>	Calibrated CCT enabled. Calibrated CCT can be customized to output specific desired light metrics.
<b>yCxxx</b>	<b>yCxxx</b> denotes the maximum current for channel <b>y</b> as configured in the controller's firmware in 20mA increments.	<b>1C###</b>	Maximum current specified up to 3,200mA. e.g. -1C200-2C200 would specify 2000mA max current for channel 1 and 2.
		<b>2C###</b>	