| ATX LED | 1108 Lavaca Ste STE110<br>Austin TX, 78701<br>512 377 6052<br><br>http://awg18.com |
|---|---|
| AL-WS-010v<br>DAbus smart<br>0-10v Dimmer<br>switch with 3-Way |  |

## Product Description - wall switch with 0-10v output and Tunable White

This wall switch has four major applications

- smart wall switch for controlling many LED drivers via manual switch
- simple stand alone 0-10v wall switch for controlling LED lighting via 0-10v controls.
- tunable white applications with color and brightness controls with dual 0-10v channels
- Fan motor speed and direction control using 0-10v operation.

This wall switch connects to a IEC standard 62386 bus. The 62386 DAbus is a multi master design that supports up to 64 unique addresses. The AL-WS-010v works autonomously, or with the ATX LED DAbus Hub - allowing large installations to be controlled by App or Voice.

## Wall Switch with Lighting control bus

The AL-WS-010v can be wired in parallel on the bus to connect to 62386 drivers from all vendors. For Example, the AL-WS-DR2 or AL-SML-DR2-70CCT, also drivers from Sunricher, Leynew, Tridonic and more. Each AL-WS-010v can have a unique address – or the same address can be used many times. When the same address is re-used – each one operates as a virtual 3-Way switch. Allowing the same LED driver to be controlled by multiple wall switches.

A proven rocker switch and brightness slider leverages mass production of 120 VAC switches, for a low voltage application – any casual user requires no training, no App to use this switch.

## Dimming and Tunable White operation

The slider allows the brightness to be adjusted. A remote switch can also be used to adjust brightness. In additional – if you enter Tunable White mode – you can adjust the color temperature of CCT fixtures using either the DAbus control method.

## DMX interfaces

A Converter is available to convert DAbus commands to DMX packets, and also, from DMX to DAbus. These are available from multiple suppliers. This allows simple wall switches in different physical locations to control DMX lights even if the sound stage in a DMX theater is not staffed.

# Specifications

| | |
|---|---|
| Power requirements | DA pins - DAbus – 2 ma max |
| Input Voltage (DAbus) | 14 to 24 volts – ( DABus) internal voltage limiter at 24v |
| Input Voltage | 12-24 volts |
| Power consumption | 64 milliwatts @ 15 volts plus the load on the 0-10v outputs if any. |
| 0 – 10v outputs | Off = 0 – 1 volt On is dimming from 1.2 volt to 10 volts |
| Protection | Reverse protection and static protection on all pins |
| Static Electricity | Ground Metal plate to protect from Static Discharge – please ground it. |
| Operating Temperature | 0°C ~ 50°C |
| Size | 108H (metal) 70H x 34 D x 42 W mm |
| Receive Addressing | Switch addressable by onboard DIP or use a DAbus master to assign a short address or group |
| Transmit addressing | DAbus 62386 standard 8 and 16 bits. |
| FCC and interference | All outputs are RF filtered for minimal interference |
| DMX support | Use a DALI-DMX device for control of a DMX universe |
| DAbus interface | DA Bus In and Out – 300 mA max AWG 18-24 gauge wire, spring terminals |
| 3-Way switching – physical | Simple contacts on the N-Way / Gnd terminals via AWG 18 – 24 wire |
| 3-Way switching – virtual | Switches operate in multi master mode Allowing virtual N-Way control |
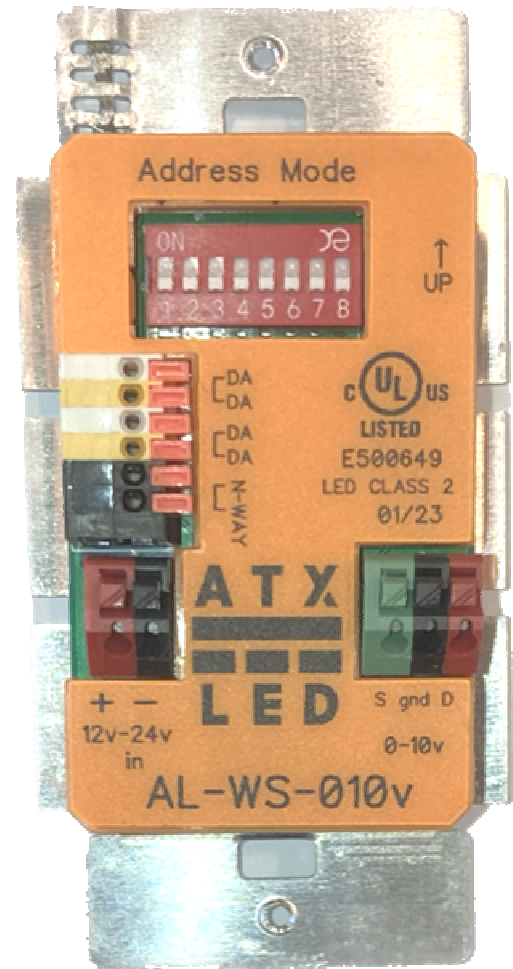
Connecting a AL-WS-010v to a DALI driver ( like Meanwell )

DA+ and DA- are interchangeable
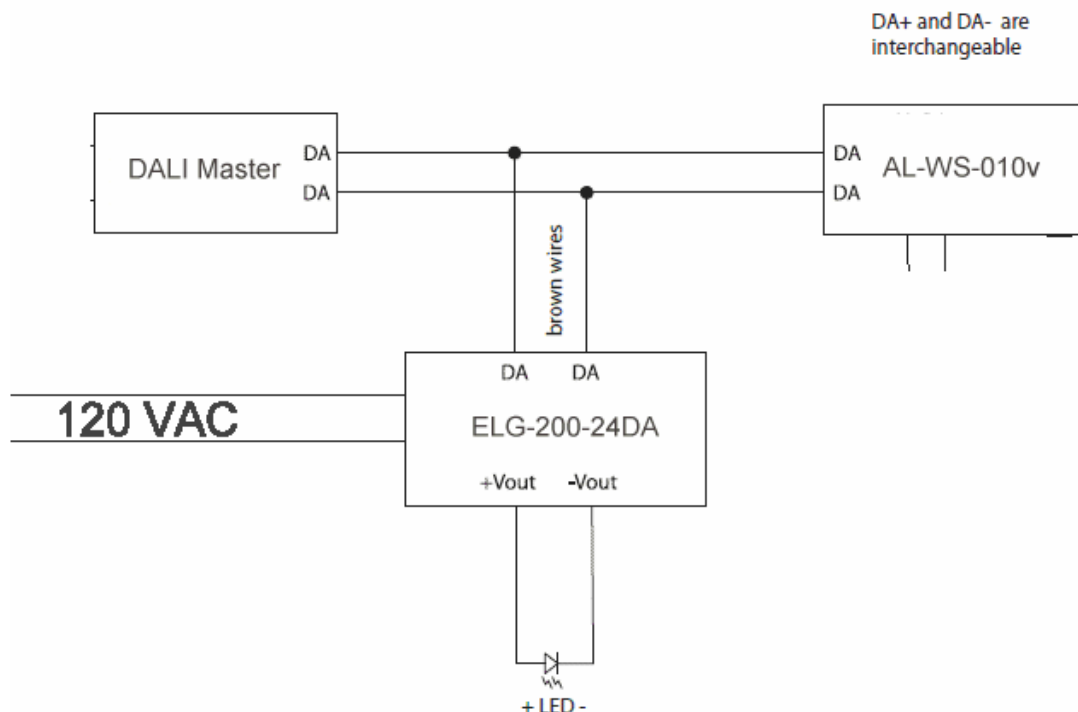
# Hardware Versions
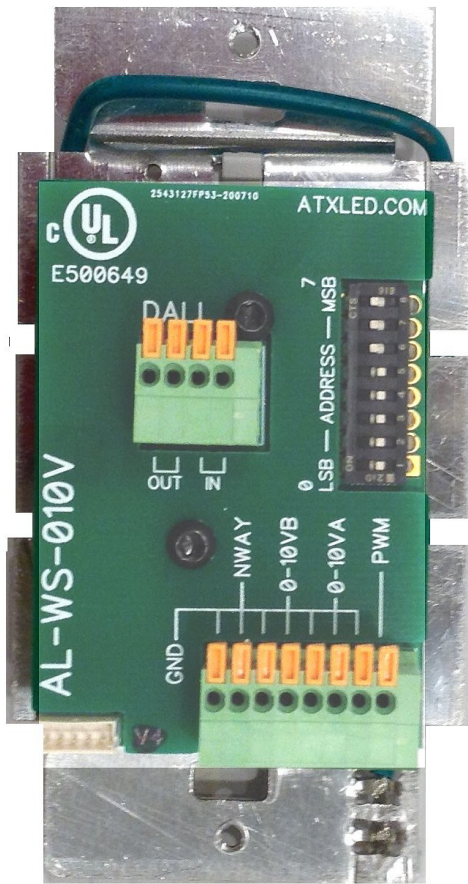
| 2019 model | 2023 model |
|---|---|
|  |  |
| DAbus provides power | DAbus provides power |
| On/Off Rocker switch | Momentary Switch |
| Slider on Right | Slider on Left |
| Optional 24v power | 12-24v optional power input |
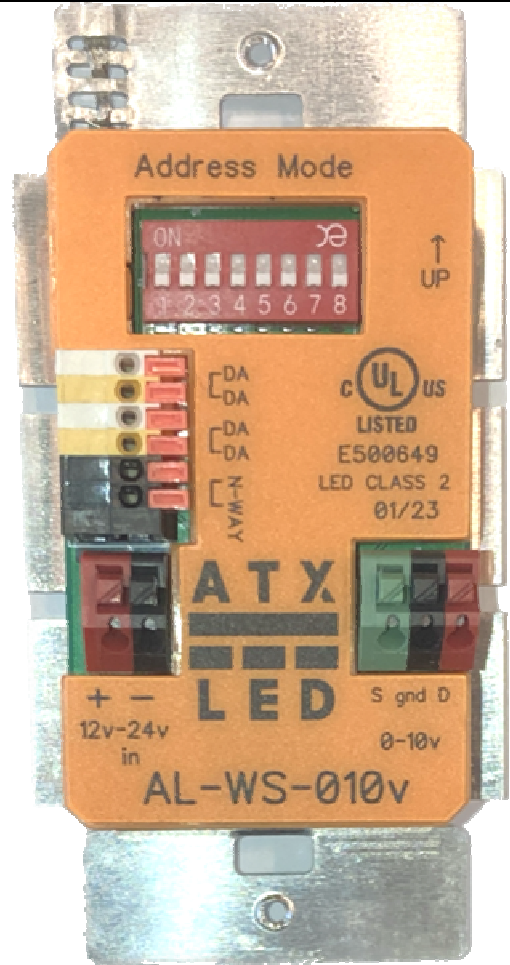
# 0-10v and 1-10v Outputs

Connect the 0-10v output(s) to your LED driver(s).  The dimming range is .4% to 100% to 254 steps.  There are two 0-10v outputs, S and D.

- S and D are the same in normal operation ( stand alone, single color, until configured by the ATX LED Hub)
- S is cool white in CCT mode,  or  Speed in Fan Motor control mode.
- D is the warm white in CCT mode, or  Direction  in Fan Motor control mode.

These are 1-10v outputs – below 1 volt is OFF, 1.2 volts is minimum Dim, 10v is maxiumum.  Use the Write Memory Bank to change the minimum and maximum voltage levels in 39.2 mV steps.   For example: 31 = 1.2 volts ( the default for minimum voltage).   Default is 31 for min and 255 for max.

| Memory Bank 17 Minimum | Off Voltage | Minimum voltage | Memory Bank 18 Maximum | Maximum Brightness |
|---|---|---|---|---|
| 31 | 0 | 1.2 Volts | 255 | 10 volts |
| 0-254 = value | 0 | Value times 39.2 mV | 1 to 255 | Value times  39.2mV |

# Powering the AL-WS-010v by DAbus

Power the switch via the DA pins, it needs about 3.5 mA to operate, minimum 13 volts.  Polarity is not significant..  A DAbus power supply has nanosecond response time, current limited output of 260 mA with no inrush.  A yellow/white pair of connectors is the DAbus.   The 2 sets of yellow/white are wired in parallel.

# Powering the AL-WS-010v by DC Voltage

Two Methods:

1. 12-24 volt power supply can be connected to the 12-24v input

2. 48 volt power supply – use a  3300 Ohm ¼ watt resistor in series, with the DAbus connection.  the device will limit the voltage to 24 volts

# Powering a Motion sensing PIR from the AL-WS-010v

A voltage between 10 and 14 volts will be available at up to 5 mA from the 12-24v connection

# Default Operation – Stand Alone

By default – the AL-WS-010v operates stand alone – no controller or master is required.  By default – this is a DC powered 0-10v dimmer for any driver.   Tandem mode requires the DAbus.

# Hardware 3-Way Operation

## N-Way signal functions

The N-Way input has several functional options.  A simple low cost switch or alarm contact can be used to activate this.   The options are:   3-Way, Push Button or Dual Output.   Default is simple 3-Way.  No DAbus is required.

## 3-Way Operation without configuration

If you need 3-Way switching please use a standard simple 2 or 3 way switch connected to the N-Way input.  Simply connect an wire (solid CAT-3 or better is recommended, solid awg20 is best) between the N-WAY pins and a remote standard wall switch.  If more control switches are needed – see our application note "AN-3Way" at http://atxled.com/pdfr.   No controller is required; an unlimited number of switches can control one light.  3-Way works in default or DAbus modes.  The N-Way input has an internal pull-up ( active low in computerspeak).  The state of the N-Way input is XOR'd with the physical switch.

## Push Button Operation

With the Push Button method -  a switch like the AL-WS-M or RH-253 can be used.  Each momentary action on the N-Way pin will toggle the light on / off.  At power on – the AL-WS-010v will observe the "ON' time of any attached N-Way switch.    If the N-Way is connected less than 500 milliseconds on 3 pushes after power on, then the AL-WS-010v operates in pushbutton mode.  Each press of the push button will toggle an internal 3-Way function.

If the Push Button mode is incorrectly, set, then setting a normal switch to ON for more than 16 seconds will indicate to the AL-WS-010v that a regular ON/Off switch is connected.

## Remote Dimming

If Push Button mode is active – then the switch connected to the N-Way input can be used to dim the LED.  Press and hold to dim the LED down.  To Dim up – hold the switch down until it fades to low, and continue to hold so it will brighten back up again. If you reach to high a dim level – then release and press again – the level will decrease.   Do not hold the button longer than 15 seconds – since this will trigger non-momentary mode.

## Door Jam Operation

With the default or Dual Output method enabled – a simple Normally Open or Normally Closed door alarm switch can be wired to the N-Way input.  Then – when the door opens – the light will go on.
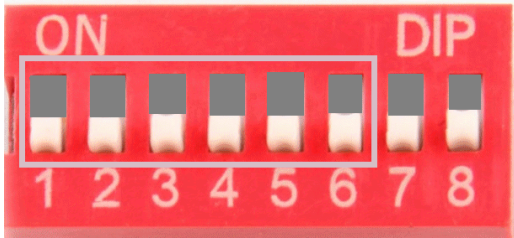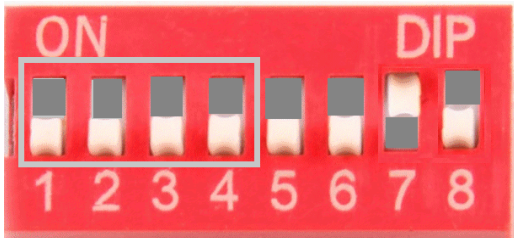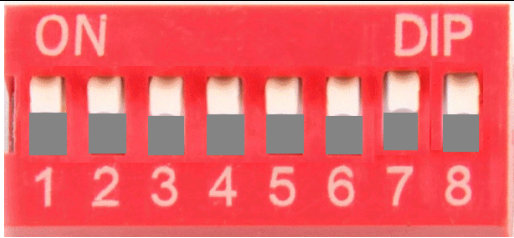
# Manual Address DABus Transceiver

In this mode, – the device accepts and sends DAbus ARC ( brightness) commands – so any other DAbus switch or master can connect to this device remotely for on/off/dimming – the 0-10v outputs are controlled by either the built in physical switch or from the DAbus. DAbus levels will override the On/Off DIM setting of the physical switch and force the output on or off. Physical Switch changes will be sent to the DAbus on the individual, group or broadcast addresses set by dip switch. After a DAbus command – flipping the physical switch will change the output again, with the DAbus acting as a virtual 3-Way switch – this is the main advantage of Transceiver mode vs. Transmitter mode.

Connect two DA terminals to your DAbus – polarity is not important. Set the address according to the switches below. The device will respond to a single address, broadcast, or group commands.

This mode allows implementation with multiple switches controlling hundreds of watts of power in 2-way, 3-way and higher switch counts without complex wiring or DAbus master.

In these modes, the device receives and transmits only DAbus ARC (brightness) commands. At power up, it will use the DAbus Min/Max commands to optimize the dimmer. See page 3 for the Min/Max logic. No DAbus configuration commands will be processed. At power on the device will restore local outputs and remote DAbus drivers to the last known values.

## Switch Settings for Manual Address DAbus Transceiver

| | Mode | Address |
|---|---|---|
|  | Individual Address<br><br>Broadcast packets are received | The built in 0-10v outputs will receive commands on the DAbus short address set by 1-6.<br><br>Switch changes will be output on this group address<br><br>LSB is switch 1, therefore DAbus address 6 has switch 2 and 3 ON. |
|  | Group Address*<br><br>Broadcast packets are received | The built in 0-10v outputs will receive commands on the DAbus group address set by 1-4<br><br>Switch changes will be output on this group address<br><br>Set the DAbus group address in 1-4, LSB is switch 1, therefore DAbus group 3 has switch 1 and 2 ON |
|  | Broadcast | Switch values will be broadcast to all DAbus devices, including those with no short addresses assigned. |

* v48 or later

# Dip Switch settings for individual address

| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 5 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 39 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 6 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 7 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 41 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 42 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 9 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 43 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 10 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 44 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 11 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 45 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 12 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 46 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 13 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 47 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 14 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 48 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 15 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 49 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 50 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 17 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 51 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 18 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 52 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 19 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 53 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 20 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 54 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 21 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 55 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 22 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 23 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 57 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 24 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 58 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 25 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 59 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 26 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 60 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 27 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 61 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 28 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 62 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 29 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 63 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 30 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | | | | | | | | | |
| 31 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | | | | | | | | | |
| 32 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | | |
| 33 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | | |

# Dip Switch Settings for Group 0-15

| Code | Dip Switch Number | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 3 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 5 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 6 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 7 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 8 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 9 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 10 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 11 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 12 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 13 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 14 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 15 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |

# Manual Address DAbus Transmitter
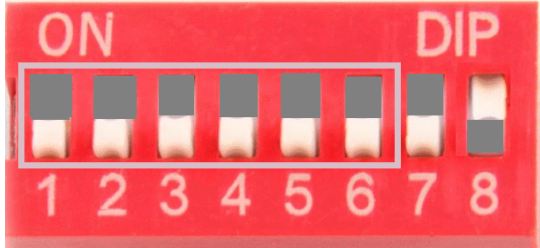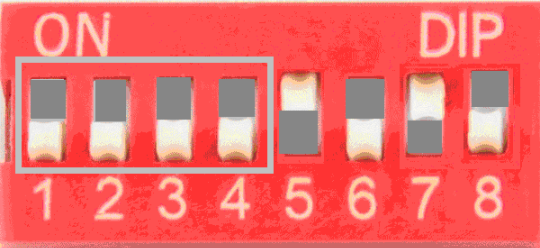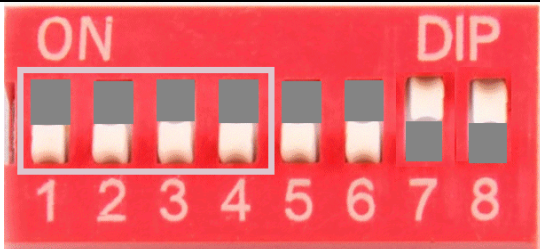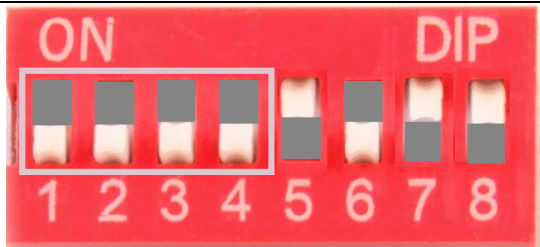
The front switch will broadcast changes in the switch settings according to the address set below:  The 0-10v outputs simply track the local dim and On/Off levels.  Only DAbus ARC (brightness) and Trigger commands are transmitted.  No DAbus configuration commands will be processed.

Remote device Min and Max will be determined automatically and listened to as explained on page 3.   Virtual 3-way is disabled – if another DAbus Master has turned a Light on/off – the rocker switch might need a double throw.

Power on DIM is set to turn the 0-10v outputs to off; no Power On DAbus packets will be sent.

DAbus Command 271 is undefined, the AL-WS-010v uses that command to implement Macro triggers – a DAbus Switch can send command 271 and a DAbus Master can convert that packet into a macro of actions.

# Switch Settings for Manual Address DAbus Transmitter

| | Mode | Address |
|---|---|---|
|  | Individual Address | The built in switch will transmit on the DAbus Short address set by 1-6<br><br>LSB is switch 1, therefore DAbus address 6 has switch 2 and 3 ON. |
|  | Trigger / Toggle | Transmit 0xBF ( command 271 ) followed by:<br><br>**16-31 off**<br>**32-95 on** |
|  | Group Address | The built in switch will transmit the group address set by 1-4,<br><br>LSB is switch 1, therefore DAbus group 3 has switch 1 and 2 ON |
|  | Scene Address | The built in switch will transmit the scene address set by 1-4,<br><br>LSB is switch 1, therefore DAbus address 6 has switch 2 and 3 ON. |
|  | Broadcast | Switch values will be broadcast to all DAbus devices, including those with no short addresses assigned. |

# Configurable (full) DAbus Operation
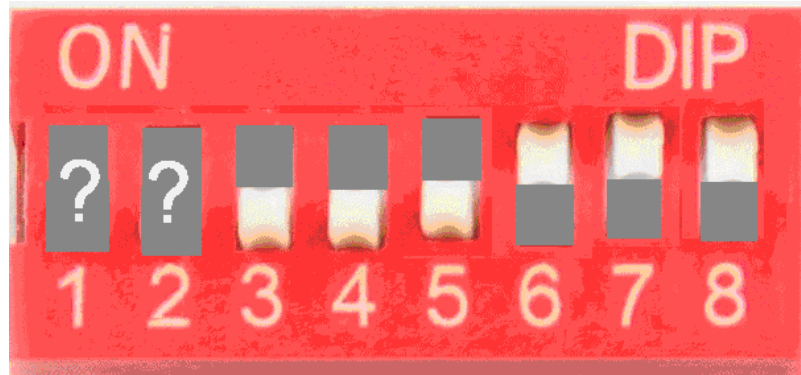


```
?? = 00   DT6   mode
?? = 10   DT8   mode
?? = 01   Fan   mode
```

## Default DAbus 62386 Operation

By default – the AL-WS-010v only responds to DAbus broadcast commands.   There is no individual group or short address assignment.  Since the device accepts DAbus broadcast commands – any DAbus Switch or master that sends broadcast commands can connect to this device remotely for on/off/dimming – the LED outputs are controlled by the switch or DAbus broadcast packets.  In Default mode – no DAbus transmissions occur, the AL-WS-010v management functions can be read back in broadcast mode, but the responses will collide with other DAbus devices.

## Full DAbus Operation

For full DAbus operation - connect your powered DAbus to a pair of DA pins (polarity is not significant) of the AL-WS-010v.  The device responds to the provisioning commands from a DAbus Master.   In order for addressable functions to work, a 'short' address [ 0 thru 63 ] needs to be assigned.   This can be done by a DAbus Master with provisioning features.  Once a short address is assigned – the device can be understood to operate as two devices in one.

> 1) 0-10v driver with DAbus control – the 0-10v outputs will have a unique DAbus Short address after provisioning.  The 0-10v outputs are connected typically to LED's ( or motors )  and they can now be controlled by DAbus Commands from the bus.   All DAbus Commands are supported.   The actual address and group is defined and can be changed by the DAbus Master.  See below.

> 2) Dimmer / Switch for other DAbus drivers.  After provisioning, the switch in this device is placed into either short address or Group mode – see below –  flipping the switch, or the 3-way remote switches, or the dimming value will cause a DAbus Command to be sent internally to the 010v outputs as well as externally to the DAbus.

> 3) Setting the short address to 255 will return the device to Broadcast receive-only mode.

Use an ATX LED Hub or similar provisioning tool to assign short and group addresses.

Note:  The DAbus and the Main and N-way switches all operate as a virtual 3-Way setup.   DAbus Commands for On/Off will execute, making the physical switch Up/Down position potentially inverted.

# DAbus address Assignment

The AL-WS-010v from the factory has no DAbus Short address by default.  A DAbus Master is used during provisioning to assign a short address to the switch.  This address will be used by default to report the user On/Off/Dim commands.

DAbus Commands also are used to determine the 3-Way state.   Therefore, a DAbus Command that is received with the matching Group or Individual as the AL-WS-010v address will set any attached 0-10v light on or off – and all local switches – physical or virtual – will reflect that change – so that the next flip of any switch will turn the light off or on as intended.   This may result in UP and DOWN being reversed – like any conventional 3-way mechanical switch.   Use the momentary switch version to avoid the "3-way effect".

The AL-WS-010v can send a group address instead of a short address, use memory bank 0:21 to implement this feature for 3-way controls.

# DAbus address Assignment - Auto – Grouping ( prior to v47)

In versions prior to v47, we have implemented a feature to allow inter switch communication without needing the ATX LED Hub.  After v47, this task is managed by the Hub.

- If the short address is from address 16-63, then the switch will output these state changes using its short address, not a group address:   This info is used by the DAbus Master to know the on/off state of every light, fan etc in the network.   It can also be used as a trigger for macros to then create a sequence of light changes.

- If the short address assigned is from 0-15, then the built-in switch will send a Group On/Off/Dim command to the DAbus each time the local status changes – On, Off, Dim, CCT – from the switch, slider or N-Way.  This method allows multiple AL-WS-010v to be configured in 'tandem' – to all operate as one switch.   Assign each device a short address between 0 and 15, then create a tandem virtual 3-way combo.  To do this, use the DAbus group feature.  For example any ATX switch at short address 1, 2, 3, would each be members of group 1, 2, 3 – allowing perfect 3-Way control – mix AL-WS-010v, AL-WS-DR2 etc with different loads on each.  Any AL-WS-DR2 or AL-WS-010v can thus be used as a 3-Way switch with full slider dimming.

# Minimum/Maximum slider range

After power up, the first OFF to ON transition of the switch will cause the switch to check the DAbus for optimal slider operation.  It will scan the DAbus to find a driver with a matching address and will read back the Min / Max levels.  In individual mode – just one address will be read.  In Group mode – the 64 short addresses will be scanned to find a member belonging to the group – the first member discovered in the group will then be individually read and the search ends.   The Min/Max levels will then be used for the bottom and top of the slider.  Therefore, dimming control remains in the useful range. This scan of the DAbus will occur with the next flip if the short address or the group address is changed (locally or by DAbus Command) or at power on.  Finally – the device is listening to DAbus Min / Max settings and storing them locally to adapt as needed to changing external fixtures.   These settings do not change the 0-10v outputs – only the Slider Values – they are not stored and are refreshed if power is restarted.

# Software 3-Way Operation – DAbus configuration

## Virtual 3-Way

The Virtual method uses 2 or more AL-WS-010v devices with the same short or group address which communicate via the DAbus.  Using the Virtual method just means that each AL-WS-010v will XOR it's physical switch state with the data it receives to its address from the DAbus.   The result allows unlimited numbers of switches to dim and control a common light.  See section below on addressing.

By extension – DAbus Commands from other devices – such as the ATX LED Hub receive commands from the Cloud ( Alexa, Google, etc) and output those on the DAbus.  These commands ( on, off, dim) override the local switch setting – operating as 3-Way switches.   Therefore, rocker UP or DOWN will be inverted if a command has arrived from the cloud.

In FW 43 and later – the virtual 3-Way group address can be set by memory location 21.   In all versions, if the address of the AL-WS-010v is set to 015, it will use that number for bus transactions as a group.  See Auto Grouping.

## Physical N-Way operation

A momentary or rocker switch such as the AL-WS-M can be connected to the N-Way input of the AL-WS-010v.  This will operate as documented on page 4.

## Group Operations

In all modes, if more than one Group is set – the device will respond to those groups – but will only broadcast physical switch and dim level changes using one group.   Either the DIP switch is used, or the group set when a short address is set by a DAbus Master.  If the short address is < 16, then the transmit group is that same address. See Auto Grouping

## Independent N-Way Operations

The N-Way input can be split from the main switch and used to send independent packets.  Set the N-Way mode to 1, and set the 2$^{nd}$ Short Address register to these values:   ( note: the local button could be out of sync with the state of the short address.

| 0-63 | Send Short Address ARC | 0-63 |
|---|---|---|
| 64-79 | Send Group Address ARC | 0-15 |
| 80-95 | Send DAbus 271 (0xBF) | 0-15 |
| 96-111 | Send DAbus 271 + OnOff | 16-31 off<br>32-95 on |
| 127 | Broadcast  ARC | 254 |

# Configurable (full) DAbus Operation – simple DT6 mode
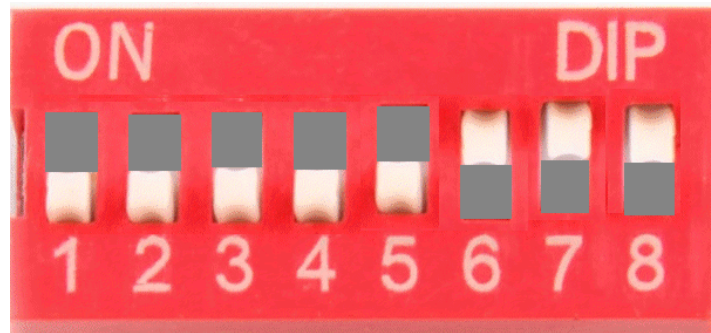


## Set to this setting to enable configuration by a DAbus Master

This mode allows the AL-WS-010v short address and all other settings to be set via a DAbus Master  - for example the ATX LED Hub.   Until configured – the device will only respond to broadcast commands, and will not transmit DAbus packets on switch changes.  By default – no short address is defined.  Use a DAbus Master to assign a short address – and all other DAbus features.

For DAbus Operation - connect your powered DAbus to the DA  pins ( polarity is not significant ).  The DAbus allows multiple masters – using collision detection to avoid conflicts on the bus.

The device responds to the provisioning commands from a DAbus Master.  In order for individual, scenes and group addressable functions to work, a 'short' address [ 0 thru 63 ] needs to be assigned.  This can be done by a DAbus Master. Once a short address is assigned – the device can be understood to operate as two devices in one.

1) DAbus driver – the 0-10v outputs will have a unique DAbus Short address after provisioning.  This address is automatically assigned by the DAbus Master – commands from the bus or will set the level of the 0-10v outputs. The 0-10v outputs are connected to the LED drivers to affect brightness.
The device responses to Group and Scene commands as configured by the Master.

2) DAbus Dimmer / Switch – after a short address is assigned, user actions locally will affect the local 0-10v outputs and will transmit these levels to the bus. There are two operation modes for this feature:

a) Single address – the changes by the user ( On/Off, Dimming ) will be sent to the bus to inform the Hub of the status and level of the lights.

b) Group mode – the switch can be set by the Master to operate in Group mode – this will cause the user initiated On/Off/Dimming to be set to the group defined – this allows all DAbus devices that are members of this group to receive DAbus On/Off and Dimming commands.

See Auto-Grouping instructions above.

# Configurable DAbus Operation – DT8 CCT
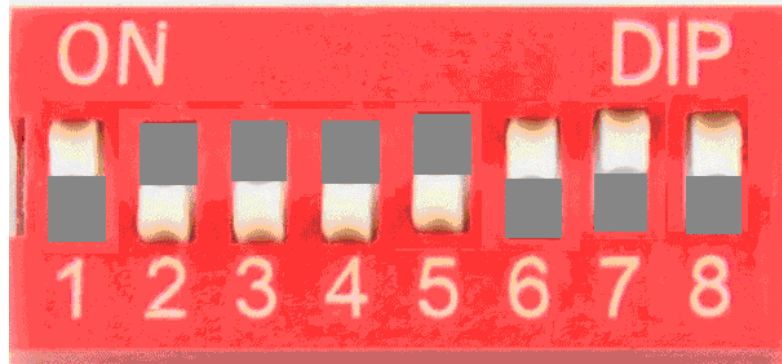


## Set to this setting to enable configuration by a DAbus DT8 Master

DAbus DT8 operation allows color tuning using one DAbus address.  The short explanation is that the two 0-10v outputs can be used to drive two LED drivers attached to two strings of LEDs with different color temperatures.  The result is human centric lighting on a large scale, one AL-WS-010v can then drive a large number of LEDs.

This mode allows the AL-WS-010v short address and all other settings to be set via a DAbus Master  - for example the ATX LED Hub.   Until configured – the device will only respond to broadcast commands, and will not transmit DAbus packets on switch changes.  By default – no short address is defined. Use a DAbus Master to assign a short address – and all other DAbus features.

For DAbus Operation - connect your powered DAbus to the DA pins ( polarity is not significant ).  Our implementation allows multiple masters – we use collision detection to avoid conflicts on the bus.

The device responds to the provisioning commands from a DAbus Master.  In order for individual, scenes and group addressable functions to work, a 'short' address [ 0 thru 63 ] needs to be assigned.  This can be done by a DAbus Master. Once a short address is assigned – the device can be understood to operate as two devices in one.

1) DAbus driver – the 0-10v outputs will have a unique DAbus Short address after provisioning.  This address is automatically assigned by the DAbus Master – commands from the bus or will set the level of the 0-10v outputs. The 0-10v outputs are connected to the LED drivers to affect brightness.
The device responses to Group and Scene commands as configured by the Master.

2) DAbus Dimmer / Switch – before and after a short address is assigned, user actions locally will affect the local 0-10v outputs.  After an address is assigned, the switch will transmit these levels to the bus. There are two operation modes for this feature:

a) Single address – the changes by the user ( On/Off, Dimming ) will be sent to the bus to inform the Hub of the status and level of the lights.

b) Group mode – the switch can be set by the Master to operate in Group mode – this will cause the user initiated On/Off/Dimming to be set to the group defined – this allows all DAbus devices that are members of this group to receive DAbus On/Off and Dimming commands.

See Auto-Grouping instructions below.

DT8 commands are documented in the IEC 62386 part 209 specifications.  DAbus Masters support this and the details are embedded into the Master software and the firmware of this device.

# Tunable White Color Control to DAbus (DT8)

When the switch is set to send CCT mode ( see CCT Mode ) – a CCT tunable DAbus DT8 driver on the DAbus will be given Color adjustment commands according to DAbus type 8 commands  Therefore color can be adjusted in a CCT LED Fixture.  The AL-WS-010v switch sends a broadcast command 272, with DTR set to 8, to enable CCT modes in the destination.  The next command sets DTR1 and DTR to the color temperature using the command 231; finally a command 226 is sent to activate the color.   Note – commands 231 and 226 can be individual or group or broadcast commands.  The low end of the slider by default is 2700 K (353) and the top end is 5000K ( less than 200).  These values are normally saved in the fixture.   These DAbus values can be updated from the DAbus Master via memory bank settings.

# Tunable White 1-10v Color Control from DAbus

When the switch has CCT enabled ( dip switches set to 1000 0011), the dual 1-10v outputs will operate in CCT mode – the values will be color shifted as selected.  Therefore color can be adjusted if wired to a CCT LED fixture with dual 0-10v inputs.

If a DAbus Master is used to set the color by 0-10v, the AL-WS-010v switch listens for a broadcast command 272, with DTR set to 8, to enable CCT mode.  The next command sets DTR1 and DTR to the color temperature using the command 231; finally a command 226 is sent to activate the color.   Note – commands 231 and 226 can be individual or group or broadcast commands.  The low end of the slider by default is 2700 K ( 353) and the top end is 5000K ( less than 200).  These values are normally saved in the fixture.   These DAbus values can be updated from the DAbus Master via memory bank settings. So that standard dimming functions operate at the selected color temperature.

# Tunable White – local selection

Moving the slider with the 0-10v outputs OFF changes the Color temperature. The slider will go from warm (bottom) to cool ( top).   Turning the switch On exits CCT mode and the slider controls the brightness again

# Configurable DAbus Operation – Motor 0-10v
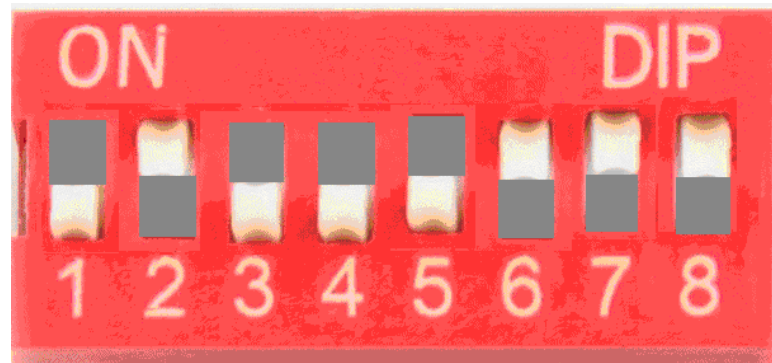


## Set to this setting to enable operation for Motors with 0-10v controls

This setting enables the two outputs of the AL-WS-010v to control a fan.  The output A is the fan speed ( 0-10v ) and the output B is the fan direction ( 0v for reverse, 10v for forward ).   We re-use the DT8 commands.

This mode allows the AL-WS-010v short address and all other settings to be set via a DAbus Master  - for example the ATX LED Hub.   Until configured – the device will only respond to broadcast commands, and will not transmit DAbus packets on switch changes. By default – no short address is defined.

For DAbus Operation - connect your powered DAbus to the DA pins ( polarity is not significant ).  Our implementation allows multiple masters – we use collision detection to avoid conflicts on the bus.

The device responds to the provisioning commands from a DAbus Master.  In order for individual, scenes and group addressable functions to work, a 'short' address [ 0 thru 63 ] needs to be assigned.  This can be done by a DAbus Master.  Once a short address is assigned – the device can be understood to operate as two devices in one.

1) DAbus driver – the 0-10v outputs will have a unique DAbus Short address after provisioning.  This address is automatically assigned by the DAbus Master – commands from the bus or will set the level of the 0-10v outputs.   The 0-10v outputs are connected to the motor for speed and direction.
   The device responses to Group and Scene commands as configured by the Master.

2) DAbus Dimmer / Switch – before and after a short address is assigned, user actions locally will affect the local 0-10v outputs.  After a short address is assigned, it will transmit these levels to the bus. There are two operation modes for this feature:

   a) Single address – the changes by the user ( On/Off, Dimming ) will be sent to the bus to inform the Hub of the status and level of the lights.

   b) Group mode – the switch can be set by the Master to operate in Group mode – this will cause the user initiated On/Off/Dimming to be set to the group defined – this allows all DAbus devices that are members of this group to receive DAbus On/Off and Dimming commands.

   See Auto-Grouping instructions below.

The Slider functions to set the speed. Turn the switch on to turn the fan on, and control the speed from the slider. The minimum level will default to about 4 volts – this can be changed by the DAbus Master

To change direction – turn the fan off, then move the slider to the top for forward, and to the bottom for reverse.  Turn the switch on to control speed.  Turn the switch off to turn the fan off

From the DAbus Master – we implemented the forward and reverse feature as "Warm" and "Cool" – this allows the fan to be easily controlled by any existing DAbus DT8 ( CCT ) controller.

# Example of Driver Connections

# Carro Ceiling Fan Motor

**Connecting a AL-WS-010v to a Carro Fan**

Dali Power

| 16v @260mA | DA |
| | DA |

DA — AL-WS-010v
DA
S D Gnd

Carro Fan
Speed — Orange
Direction — Black
Common — Green
Fan Power+ — Pink — +48V
Common — Blue — GND

To LED driver
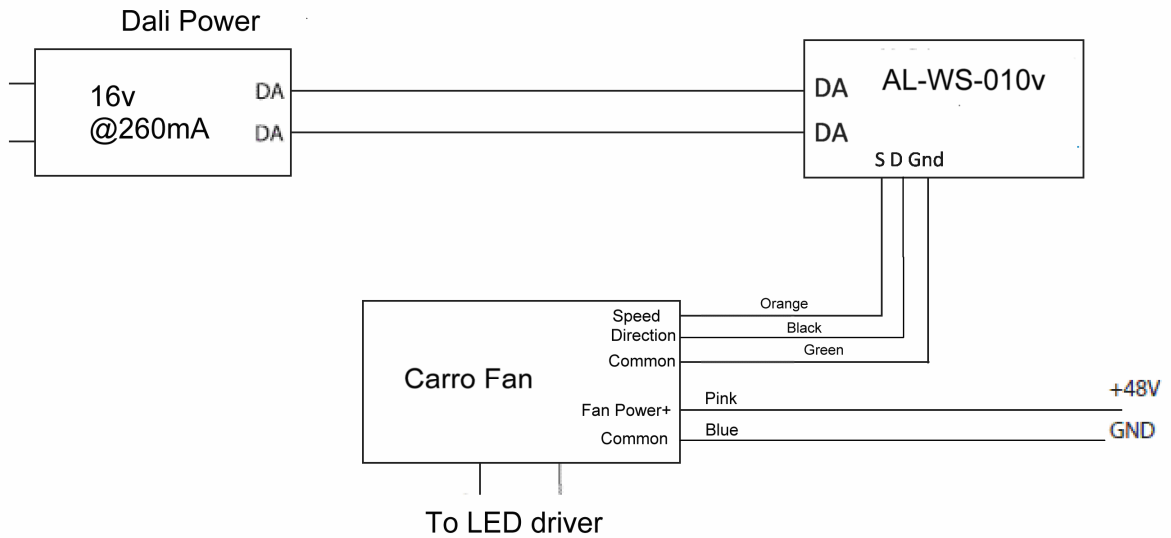
# Meanwell LDD-350H-DA   DALI

**Connecting a AL-DALI-010v to Meanwell LDD-350H-WDA**

DA+ and DA- are interchangeable

DALI Power

Power from the wall
DA
DA

DA — AL-DALI-010v
DA
0-10v

brown wires

LDD-350H-WDA
DA    DA
+Vin — red wire — +48V
-Vin — black wire — GND
+Vout    -Vout

Yellow wire    blue wire

+ LED -
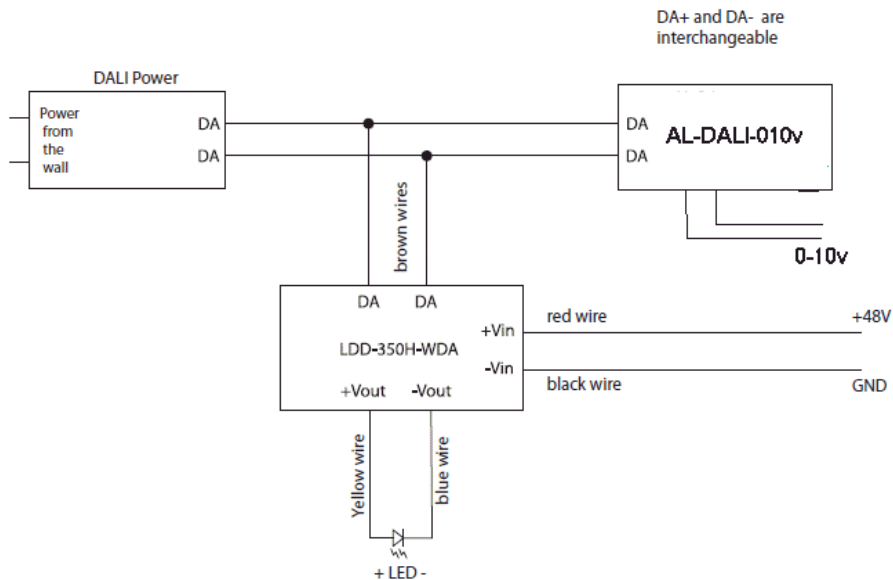
# Example of Driver Connections

## Sunricher SRP-2309-75

Connecting a AL-WS-010v to a DALI driver

DA+ and DA- are interchangeable

DALI Master | DA | DA | AL-WS-010v

Yellow

White

120 VAC

DA    DA

SRP-2309-75

+Vout    -Vout    +Vout    -Vout

200 ft or more

+ LED -    + LED -
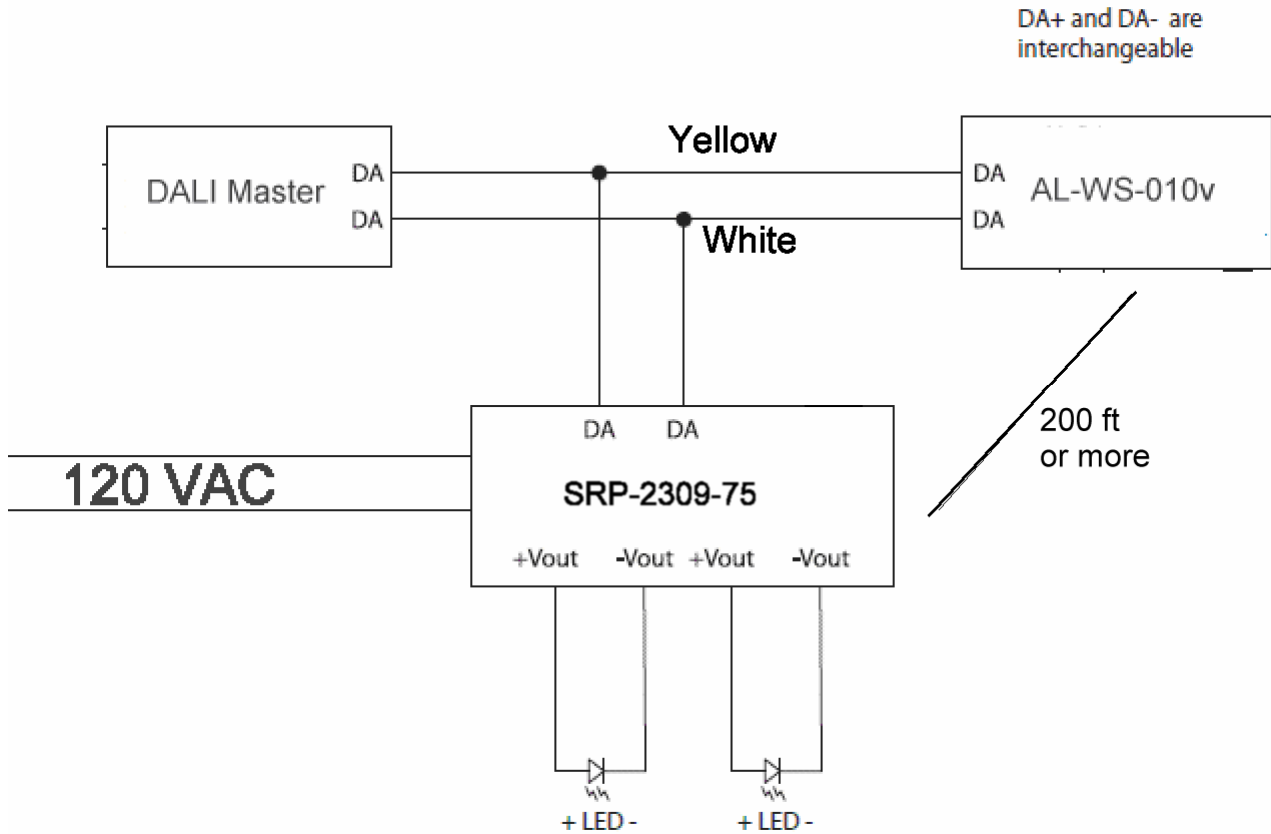
# DAbus Commands Supported

Notes:  * = 2x in 100ms,   A = ATX LED,   C = CCT modes

|   |     |                                                       |                    |
|---|-----|-------------------------------------------------------|--------------------|
|   | 0   | LED Off                                               |                    |
|   | 1   | UP   8 steps                                          |                    |
|   | 2   | Down 8 steps                                          |                    |
|   | 3   | UP one step but don't turn on                         |                    |
|   | 4   | Down one step but not off                             |                    |
|   | 5   | Set to MAX level                                      |                    |
|   | 6   | Set to Min level                                      |                    |
|   | 7   | Down one step and Off if needed                       |                    |
|   | 8   | Up one step or on if needed                           |                    |
|   | 32  | Reset to defaults ( don't change Short Address)       |                    |
|   | 33  | Save ARC level to DTR                                 |                    |
| A | 35  | Set N-Way mode ( DTR is the value )                   | See table below    |
|   | 38  | Reset switches to mechanical state ( Up = On )        |                    |
|   | 42  | Store DTR as new Max Level,                           |                    |
|   | 43  | Store DTR as new Min Level                            |                    |
|   | 44  | Store DTR as new system Fail Level                    | Not used           |
|   | 45  | Store DTR as new power up level                       |                    |
|   | 46  | Store DTR as Fade Up duration                         |                    |
|   | 47  | Store DTR as Fade Down duration                       |                    |

FADE times in seconds ( 0-7 )     0,  .7,  1.0,  1.4,  2.0,  2.8,  4.0,  5.6
( 8-15 ) , 8.0, 11.3, 16.0, 22.6, 32.0, 45.2, 64.0, 90.0

|   |     |                                          |                        |              |
|---|-----|------------------------------------------|------------------------|--------------|
|   | 49  | Set UPS mode, DTR => temporary Maximum   | Min-254                | Reset with 255 |
|   | 128 | Store DTR as short address               |                        |              |
| * | 129 | Enable memory Bank write                 |                        |              |

144     Query Status

|       |                                    |
|-------|------------------------------------|
| bit 0 | Left Led Fail ( DR2 )              |
| bit 1 | Right LED Fail  ( DR2 )            |
| bit 2 | ARC Level greater than 0           |
| bit 3 | ARC setting out of range           |
| bit 4 | Fade in action                     |
| bit 5 | Device not configured after reset  |
| bit 6 | Missing Short Address              |
| bit 7 | No ARC level set after power failure |

|   |     |                                                      |
|---|-----|------------------------------------------------------|
|   | 145 | Query if Short Address matches one stored            |
|   | 146 | Query if either attached LED failed or missing       |
|   | 147 | Query if LED on                                      |
|   | 148 | Query if ARC command exceeded Min / Max              |
|   | 149 | Query if in Reset state                              |
|   | 150 | Query if no address assigned                         |
|   | 151 | Query 62386 version number ( == 1)                   |
|   | 152 | Query DTR                                            |
|   | 153 | Query LED type ( return 6 normally, or 8 if CCT mode enabled |
|   | 154 | Query Physical DIM level ( See DR2 info)             |
|   | 155 | Query Power Failure                                  |
|   | 156 | Query DTR 1                                          |
|   | 157 | Query DTR 2                                          |
| A | 158 | Query N-Way mode                                     |
|   | 160 | Query Actual Dim Level                               |

# DAbus Commands Supported

|     |     |                                                        |                             |
|-----|-----|--------------------------------------------------------|-----------------------------|
|     | 161 | Query Max Level                                        |                             |
|     | 162 | Query Min Level                                        |                             |
|     | 163 | Query Power On Dim Level                               |                             |
|     | 164 | Query System Fail Level                                |                             |
|     | 165 | Query Fade Rate value                                  |                             |
| A   | 166 | Query HW Type ( 2 = 0-10v, 1 = DR2)                    |                             |
|     | 171 | Query presence of 0-10v in transceiver mode = response == 0xA5 |                  |
|     | 192 | Query group association 0-7                            |                             |
|     | 193 | Query group association 8-15                           |                             |
|     | 194 | Query Random High bits                                 |                             |
|     | 195 | Query Random Middle bits                               |                             |
|     | 196 | Query Random Low bits                                  |                             |
|     | 197 | Query Memory Bank address DTR1:DTR                     |                             |
|     |     |                                                        |                             |
| C   | 226 | Save CCT setting                                       |                             |
| C   | 231 | Set CCT color ( value from DTR )                       |                             |
| C   | 232 | Step CCT Cooler                                        |                             |
| C   | 233 | Step CCT Warmer                                        |                             |
| C   | 250 | Query Color                                            |                             |
|     |     |                                                        |                             |
|     | 255 | Test CCT mode                                          | Response is 209             |

Global Commands – processed by all DAbus devices on the bus

|     |     |                                     |              | Hex |
|-----|-----|-------------------------------------|--------------|-----|
|     | 256 | Terminate                           |              | A1  |
|     | 257 | Set DTR                             |              | A3  |
| *   | 258 | Initial Addressing Mode             |              | A5  |
|     | 259 | Randomize                           |              | A7  |
|     | 260 | Compare Random Address              |              | A9  |
|     | 261 | Withdraw from Random Addressing     |              | AB  |
|     | 264 | Set High Byte                       |              | B1  |
|     | 265 | Set Middle Byte                     |              | B3  |
|     | 266 | Set Low Byte                        |              | B5  |
|     | 267 | Set Short Address if match          |              | B7  |
|     | 268 | Query Short Address                 |              | B9  |
|     | 269 | Query Long Address Match            |              | BB  |
|     | 272 | If value == 8, enable CCT mode      |              | C1  |
|     | 273 | Set DTR1                            |              | C3  |
|     | 274 | Set DTR2                            |              | C5  |
|     | 275 | Write Data at Memory Bank DTR1:DTR  | Send confirm | C7  |
|     | 276 | Write Data at Memory Bank DTR1:DTR  | no response  | C9  |

# Memory Bank 0

| Address | Fw version | Bank 0 Name | Read / Wrie | Bank 0 Value |
|---------|-----------|-------------|-------------|--------------|
| 0 | | Bytes per Bank ( minus 1) | R | 63 |
| 1 | | Checksum | R | calculated |
| 2 | | Number of Banks ( minus 1) | R | 3 |
| 3 | | UPC code – msb | R | 722512407282 |
| 4 | | UPC code | R | |
| 5 | | UPC code | R | |
| 6 | | UPC code | R | |
| 7 | | UPC code | R | |
| 8 | | UPC code – lsb | R | |
| 9 | | FW Version | R | |
| 10 | | HW Version | R | |
| 11 | | Serial Number – msb | Y | Assigned by Master |
| 12 | | Serial Number | Y | |
| 13 | | Serial Number | Y | |
| 14 | | Serial Number – lsb | Y | |
| 15 | >43 | N-Way Mode | Y | 0 = normal, 1 = 2$^{nd}$ Short Add |
| 16 | >43 | N-Way Short Address | Y | 255 |
| 17 | | 0-10v Minimum Dimming Voltage ( off is always 0 volts) | Y | Default: 25 = 1.0v |
| 18 | | 0-10v Maximum Voltage | Y | Default: 254 = 10 volts |
| 19 | | DT8 value for cool divided by 2 | Y | Default is 0 |
| 20 | | DT8 value for warm divided by 2 | Y | Default is 176 ( 354 ) |
| 21 | >43 | Group used to send switch changes 255 or 0-15 | Y | Default is 255 ( send short address) |
| 22 | >50 | Switch rocker/ Momentary | W | LSB = Main Bit 1 = N-Way |

# Memory Bank 1-3

| Address | Name | Value |
|---------|------|-------|
| 0 | Bytes per Bank ( minus 1) | 63 |
| 1 | Checksum | Calculated |
| 2 | Number of Banks ( minus 1) | 3 |
| 3-63 | User Storage | |

# Memory Bank 4 (read only)

| Address | Name | Value |
|---|---|---|
| 3 | Up Time | Hours / 256 |
| 4 | Up Time | Hours<br>(8 years max) |
| 5 | On Time | Hours / 256 |
| 6 | On Time | Hours<br>(8 years max) |
| 11 | Read back mode switch | - |
| 13 | Nway Momentary | 0= On/Off, 1 = Momentary |
| 14 | Main Momentary | 0= On/Off, 1 = Momentary |

# System Configuration and Debug Tools

Version 31 and later firmware supports these debug operations:  Note – these are broadcast commands, so every device on the bus will be programmed to these settings.  Use with care.

### Mode 253 Pulse mode:  ( 1011 1111 )

  Setting the DIP switches to 253 enables pulse mode. The lights will all be set to Warm, then Cool, then off, each 2 seconds. The cycle will stop if the switch is turned off – it can be stopped in Warm, Cool or Off.  FW 42 or later.

### Mode 252 Local 0-10v outputs - Minimum dim setting  (  0011 1111 )

  Setting the DIP switches to 252 ( all on, #1 and #2 off ) enables physical minimum dim mode of this switch.  Turn the Rocker off. When the rocker switch turned from OFF to ON, moving the slider will adjust the physical minimum dim level, this value will be stored into device memory when you turn the slider OFF.  When off, change the DIP switch settings to the operational mode needed.

### Mode 251 set Minimum dim setting of ALL remote devices 1101 1111  ( contact factory )

  Setting the DIP switches to 251 ( all on, #3 off ) enables setting the minimum dim value.  After turning the rocker switch from Off to On, moving the slider will adjust the Minimum dim level of ALL connected DAbus devices on the bus, these values will be stored into device memory of every device on the bus.  Take note! Turn the slider OFF when done, then change the DIP switch settings.  Disconnect any device that should not be programmed!

### Mode 249 set Power On/Fail level of ALL remote devices   1001 1111   ( contact factory )

  Setting the DIP switches to 249 ( all on, #2 and #3 off ) enables setting Power / Fail values.  Turning the rocker switch from Off to On, the slider will adjust the Fail and Power On dim level of ALL connected DAbus devices on the bus, these values will be stored into device memory of every device on the bus.  Take note!.  Turn the slider OFF when done, then change the DIP switch settings.

# Power Up ID

If the AL-WS-010v is not in managed mode – then the first time a switch is flipped, 2 DAbus packets will be output.   These 2 bytes are sent with global command 0xC3 – this loads the DTR2 register – and informs a bus master or logger of the hardware and firmware version.