ATX LED

100% DC low voltage

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AL-WS-DR1-VAC

- Vacancy operation
- Meets Title 24 specs
- Ambient Light Sensor
- Nightlight
- LED driver (30 watts)
- FAN driver (12 watts)
- Push Button Switch
- Fan Timer mode
- 3-Way supported
- Gang Operation
- DALI option
- Occupancy on request

Product Description - AL-WS-DR1 wall switch with Vacancy only

This switch operates just like any standard residential light switch – however it takes 24-51v DC instead of 120VAC, and directly drives up to 30 watts of LED bulbs or a 12 watt fan. This Decorator style switch in a standard residential style outline fits into any home, looks like any switch yet meets NEC article 411 for Low Voltage lighting. It also meets Title 24 vacancy code requirements for lighting controls.

When used as a LED switch - the built in Ambient Light sensor, and presence sensor, exceedsTitle 24 requirements. The switch can operate in:

- Vacancy mode (manual on, automatic off)

When used as a FAN controller – the push button starts the fan and it runs for a user defined time. Vacancy will turn the fan off after a programmable delay. Occupancy will turn the fan ON if presence is detected for a settable duration. Fans are automatically detected.

Unlike conventional On/Off vacancy switches – the dimming feature of this device means that the light does not go off all at once, instead, it dims slowly down to zero. Should someone be in the room and undetected – the room does not go dark – allowing the occupant to create sufficient motion to maintain light.

Stand alone it operates as a simple switch for 30 watts of LED's. For example, 5x 6 Watt LEDs can connected in series to this switch / dimmer device. Use AWG 16 or 18 to bring 48v (or 24 to 52 volts) from a central power supply over to the switches, then use AWG 20 to connect to your LEDs – no crimping tools are required to wire this device.

For 3-way operation – a simple 2 wire link with AWG24 or better allows 2, 3, or an unlimited numbers of switches to control one set of LED's. Any single pole switch found at Home Depot can be used to add a 3-Way remote switch, or the AL-WS-M momentary switch can be used for unlimited 3-Way connections. Multiple AL-WS-DR1 devices can communicate without any Hub using this interface.

To enable Home / Business automation – the AL-WS-DR1-VAC includes a DALI serial bidirectional port for remote and voice control and central management. Use the AL-DALI-Pi Hub to connect to Alexa or Google home voice control. The DALI protocol is supported, with automatic addressing. Use low cost wire in uncomplicated topology to implement remote management. Power and DALI have in and out connectors to avoid wire nuts.

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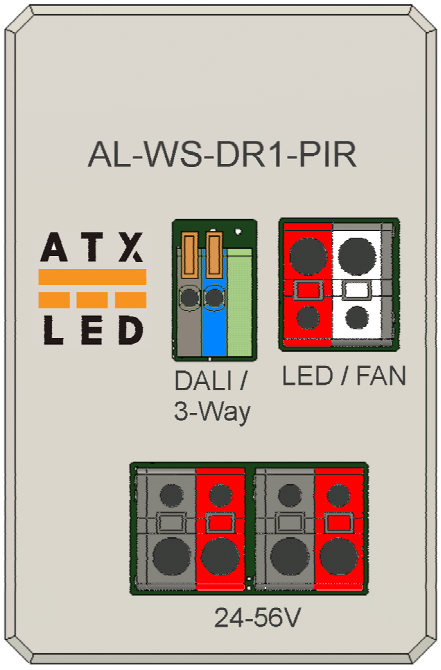
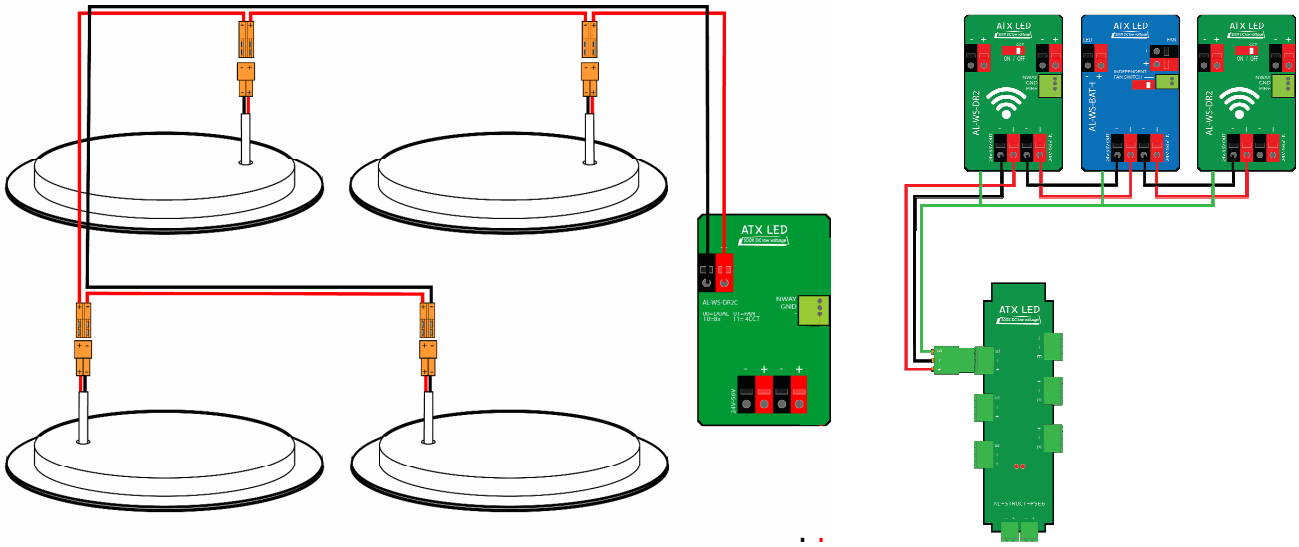
Specifications

Power source and load	Spring loaded connectors (2 pairs) for AWG 16-20 wire
LED constant current output	660 mA with 0 to 100% dimming Spring loaded connectors (1 pair)
Input voltage range	24v to 52 volts (power for LEDs)
Standby power consumption	<50 milliwatts
Conversion efficiency	Over 95%
Protection	Reverse protection and static protection
Operating Temperature	0°C ~ 50°C
Size	115 x 46 x 50 mm
Dimming	100% to 1% Current control with temperature tracking
FCC and interference	All outputs are RF filtered for minimal interference
Maximum output voltage	Input minus 4 volts
Minimum output voltage	6 volts, minimum current self calibrating*
Hot Swap	Yes – can unplug and connect LEDs with power applied.
DALI interface Individual, group and scene support	AWG 18-24 gauge wire spring fit short and long addresses 16 to 24 volts 2 mA
User Programming	Limited user programming supported by a round button
N-Way input	see features list
FAN output	12 volts, 1 amp with speed control
FAN Timer	0 to 90 minutes – using DALI commands



Wiring the AL-WS-DR1-VAC

See http://atxled.com/How2 for more examples



Powering the AL-WS-DR1-VAC

Power the switch via the Power input connectors, 48 to 52v is recommended. No DALI connection is required. You can feed from the input to the output up to 2 amps. After power up – you might see a flicker while it learns the capability of the attached LED. After that phase – the result is stored in on-board EEprom and will be updated for temperature and aging changes or each time the slider is moved to low dim.

Default Operation – stand alone

By default – the AL-WS-DR1-VAC operates stand alone – no controller or master is required. Connect the LED output to your LED's. See https://atxled.com/How2 for wiring suggestions. No other wires are required. Press the button and the light will turn on.

Presence Sensing

The AL-WS-DR1-VAC detects the presence of people by Infrared passive sensing. The sensitivity is learned over time. Each time the On button is pressed, since a person is obviously present – this defines the maximum required sensitivity. Each time the On button is pressed when the switch has inferred that no person is present, the minimum sensitivity will be increased. The light can be turned off from the switch as well, each time the light is manually turned off, after the expected vacancy timeout period, we can infer that sensitivity needs to be reduced.

Ambient Light sensing

When the DR1 has turned the attached LEDs off – it can measure the light in the room. If there is enough light in the room – then detection of presence will not automatically turn the lights on, the user would have to press the switch to turn the lights on.

Vacancy Sensing and learning

When the DR1 has detected no presence for 120 seconds, the fade dimming to off begins. This will slowly turn the lights off to allow anyone in the room to reach the switch before the room is dark. A button press during fade dim, indicates that the vacancy sensing was not sensitive enough and the device will increase sensitivity.

Nightlight

If enabled, the AL-WS-DR1-VAC will turn on a light to guide people in the room without turning the lights on. This is most useful in Vacancy mode. The night light brightness is controlled by DALI settings.

Fan operation

If a fan is detected, then the device will drive a Fan. In this mode, the push button adds 10 minutes of run time with each press, automatic On/Off can be enabled.

3-Way operation

The device has a 3-Way input that allows simple AL-WS-M switches to be used for On, Off and Dim

On / Off Operation

Press the button once to toggle the light on or off. If the light is turned on by the switch, then in the next 2 seconds, each further press extends the Vacancy time by 10 minutes. If the DALI bus is configured – DALI On/Off commands will be transmitted.

Local and Remote Dimming

Press and hold the switch 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. If the DALI bus is configured – DALI dim commands will be transmitted.

Auto Gang Operation

If no DALI address is assigned, the AL-WS-DR1-VAC assumes that the device is in autonomous mode, and not connected to a DALI bus. In this mode, each time there is an On/Off event locally – the device will transmit via DALI the dimming level using the reserved command 171 this will be recognized by other AL-WS-DR1-VAC as a ARC level command and ignored by regular DALI devices. This allows multiple devices to be connected as one large, multi motion sensing network controlling a large number of LEDs.

User Programming

The round programming button is used for setting user options. It is used together with the main switch. Press the two switches as shown below, the nightlight will flash each time the second button is pressed. Repeat until the operation mode requested is active as confirmed by the flashes of the nightlight. In Title 24 states, the Occupancy mode is disabled. This mode will be exited 15 seconds after no action is performed.

Round button pressed and held Large button is tapped			Large button pressed and held round button is tapped	
Option	Function	Number of flashes	Option	Function
Manual	Manual Control Only	1	Fan - manual	No Automation
LED Occupancy*	Automatic on, Automatic off	2	Fan – 90 second Delay to ON	Automatic On Automatic Delay Off
LED Vacancy	Manual On Automatic Off	3	Fan – Vacancy	Manual On Automatic Delay Off
LED Ambient	Automatic On if dark, Automatic Off	4	Nightlight	Enter Nightlight Brightness Mode

Nightlight Brightness Mode

If the device is placed into Nightlight Brightness mode, then the brightness of the nightlight will be controlled by the large button for the next 15 seconds. Toggle the nightlight on/off or dim it by pressing and holding the main switch. Once the level is set, don't do anything for 15 seconds.

ZWD Hub Controlled Operation

Default DALI Operation

By default – the AL-WS-DR1-VAC responds to DALI broadcast commands. There is no group or short address assignment yet. Since the device accepts DALI broadcast commands – any DALI 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 DALI broadcast packets. In Default mode – no standard DALI ARC Level transmissions occur. DALI received commands are treated like 3-way switch controls.

Auto Virtual 3-Way Operation

If no DALI address is assigned, the AL-WS-DR1-VAC assumes that the device is in autonomous mode, and not connected to a DALI bus. In this mode, each time there is an On/Off event locally – the device will transmit via DALI the dimming level using the reserved command 171 in broadcast mode - this will be recognized by other AL-WS-DR1-VAC as an ARC level command and ignored by regular DALI devices. This allows multiple devices to be connected as one large, multi motion sensing network controlling a large number of LEDs.

Full DALI Operation

For full DALI operation - connect your powered DALI bus to the DA+ connections of the AL-WS-DR1-VAC. The device responds to the provisioning commands from a DALI master. In order for addressable functions to work, a 'short' address [0 thru 63] needs to be assigned. This can be done by a DALI Master with configuration features. Once a short address is assigned – the device can be understood to operate as two devices in one.

1) LED driver with DALI control – the LED outputs will have a unique DALI short address after provisioning. The LED driver outputs are connected to LED's and each switch can now be individually controlled by DALI commands from the bus. All DALI 60929-2006 commands are supported. The actual address and group is defined and can be changed by the DALI master. See below.

2) Dimmer / Switch with DALI outputs – after provisioning – the mechanical front 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 slider dimming value will cause a DALI command to be sent internally to the LED outputs as well as externally to the DALI bus.

3) A DALI Short Address Reset command will return the device to Broadcast receive mode and disable all On/Off/Dim transmissions.

Use a AL-DALI-PI or DALI-100 or similar provisioning tool to assign short and group addresses.

DALI Address Assignment - Auto - Grouping

The switch from the factory has no DALI Short address by default. When a DALI master assigns a short address to the switch, one built-in feature rule has been implemented in all DALI ATX-LED devices.

- If the short address assigned is from 0-15, then the built-in switch will send a Group On/Off/Dim command to the DALI bus each time the local status changes – On, Off, Dim – from the switch, slider or N-Way. This method allows multiple DR1-VAC to be configured as a gang – to all operate as one switch. After assigning each DR1-VAC a short address less than 16, add to eachAL-WS-DR1-VAC the group address of the others to be ganged together. An AL-WS-010v can also be assigned to the same group.

  An Al-WS-010v can thus be used as a 3-Way switch with full slider dimming. Use the dip switches in the AL-WS-010v to set it to a fixed Group address 0-15 for remote On/Off/Dim. Set the AL-WS-010v via dip switch to a Group (say starting at 15 downward) and use the DALI Master to assign theAL-WS-DR1-VAC target to the same numeric short address as that Group (say 15)

- 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: An AL-WS-010v can be assigned the same short address to implement 3-way control with dimming.

DALI commands also are used to determine the 3-Way state. Therefore, a DALI command with the matching Group or Individual address will set the 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.

Software 3-Way Operation

DALI commands also are used to determine the 3-Way state. Therefore, an Alexa to DALI interface will set the 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.

The Virtual 3-Way method uses 2 or more AL-WS-010v devices with the same short or group address which communicate via the DALI bus. 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 DALI bus. The result allows unlimited numbers of switches to dim and control a common light. Since eachAL-WS-DR1-VAC or 010v device supports the N-Way input – the number of control points is limitless.

Note: DALI commands from other devices – such as AL-DALI-Wiz or AL-DALI-Pi receive commands from the Cloud (Alexa, Google, etc) and output those on the DALI bus. 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.

DALI configuration

See the AL-WS-DR2 spec for the full set of DALI commands. Unique to this device are the DALI memory bank 0 uses. It is read / writable

0:15 is the N-Way mode, same as function 35 below
0:16 is an 8 bit value of the On-Time timeout in seconds
0:17 is an 8 bit value of the sensitivity for Vacancy (once set, learning is disabled)
0:18 is an 8 bit value of the sensitivity for Occupancy detection
0:19 is an 8 bit value of the brightness of the nightlight
0:20 is an 8 bit value of the Ambient light sensor threshold
0:21 is an 8 bit value of the number of seconds for fade out when vacancy occurs

N-Way signal options set via DALI command 35

Using the Dali command 35 – several modes are available. A DALI command 35 with the following values will select these advanced features. These settings override and disable the round programming button

0	THREE WAY	Default
2	Full Automatic	Turn on when presence is detected and the room is dark
3	Occupancy	Not supported
4	Vacancy	Manual turn on, turn off after a delay with no presence detected.
5	Ambient	Commercial applications only
6	FAN	Force fan mode (CV 12 volts)

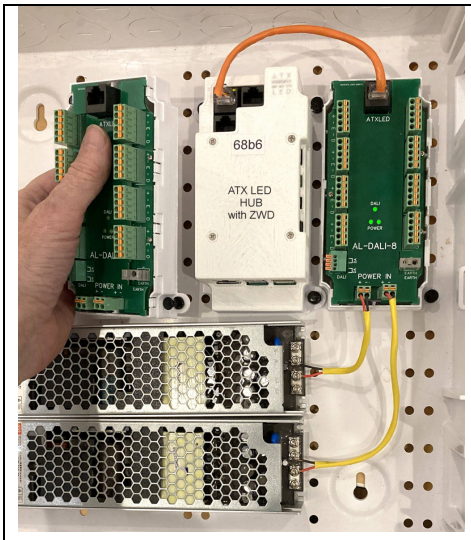
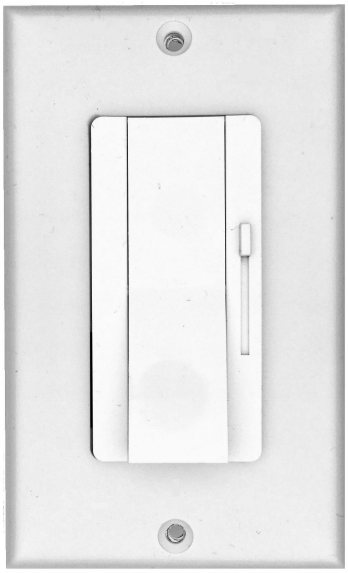
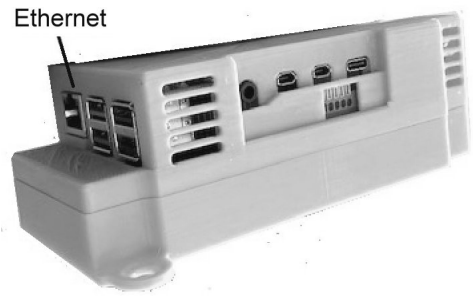
Fan control

Intended for bathroom fans, if the B output is a light, and the light switch is turned on locally and stays on, then the A output will be turned on for the Hold-ON duration. The delay before turn on is set by the DALI command 51, then once on, the on time is set by the DALI command 52. If the light stays on, the fan stays on past the Hold-On time

DALI	Function	Set DTR value before these commands	Scale
50	Fan Idle	Sets the speed of the fan when it is 'off' – can set a low level	20-200
51	Delay before ON	∞, 7, 10, 14, 20, 28, 40, 56, 80, 113, 160, 226, 320, 452, 640, 900 Seconds	0 = ∞ 15=900
52	Hold-ON	∞, ½ , ¾, 1, 1 ½ , 2, 3, 4, 5, 8, 10, 15, 20, 30, 40, 60 Minutes	0 = ∞ 15=60
53	Fan Operate	Sets the speed of the fan when it is 'on'	50-254

∞ means never. The A output can also be controlled by a simple contact switch connected to the N-Way input. The N-Way switch overrides the timers. Note: Set mode 35 to FAN to set Delay and Hold. Set mode 35 to 0 to set lamp fade rates – then change to Fan mode to set Delay and Hold

DALI bus products from ATX LED Consultants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