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Multi Button multi function Wall Switch

AL-WS-8B,
AL-WS-8B1P,
AL-WS-8B-OEM

Product Description - wall switch with up to 8 buttons

This wall switch has these applications

- up to 8 individual DALI devices can be controlled
- up to 8 groups can be controlled
- up to 8 scenes can be recalled.
- the above can be mixed
- using our ZWD software package – each button can be configured to “trigger” complex actions
- On / Off / Dimming is supported

On-Add to the Legrand LVSW Wattstopper switch with 1, 2, 3, 4 or 8 buttons

Once the AL-WS-8B has received an address from the DALI bus, each button pressed on an attached LVSW will send a user defined command when pushed. For example, in single address or group mode, press and release to change On -> Off or Off -> On. Press and hold to dim. Purchase the LVSW you need online.

Virtual 3-way supported, Dimming operation

Each button recalls the state of the associated individual address or group. Therefore proper On and Off controls will be sent. press and hold to dim. Dimming level synced with the destination address or group.

DALI interface for proven reliability, Works with any DALI master

Uses the robust and proven DALI bus for controls Address, Group, Scene assignment is possible with any DALI configuration tool.

Optional LED driver output

The AL-WS-8B1P device adds a PWM controlled output for an ATX CV type light or ATX Exhaust fan motor. Light Bulbs, Strips, and downlights are compatible with this output.

Powering the AL-WS-8B

Power the switch via the DA pins, it needs about 1.5 mA to operate, plus about 2 mA for each LED that is fully on, minimum 13 volts. Connect your powered DALI bus to the DA Gray and Blue pins (polarity is not significant). Our implementation allows multiple masters – we use collision detection to avoid conflicts on the bus.

Buttons on the AL-WS-8B

Each button can be assigned an individual function – see the commands shown below. You can set individual, group, scene or broadcast actions to each button. You can also change the buttons to simply send their On/Off status. By default, the buttons are in group mode, groups 0 thru 7. When a DALI address is assigned, button 1 will be set to single address transmit – using the same address as the AL-WS-8B itself, so you can locate new AL-WS-8B on the DALI bus.

Display LEDs on the AL-WS-8B

Each LED can be controlled using the DALI address of the button. By default, these LEDs stay on for 4 seconds after a button is pressed, at the brightness of the destination driver.

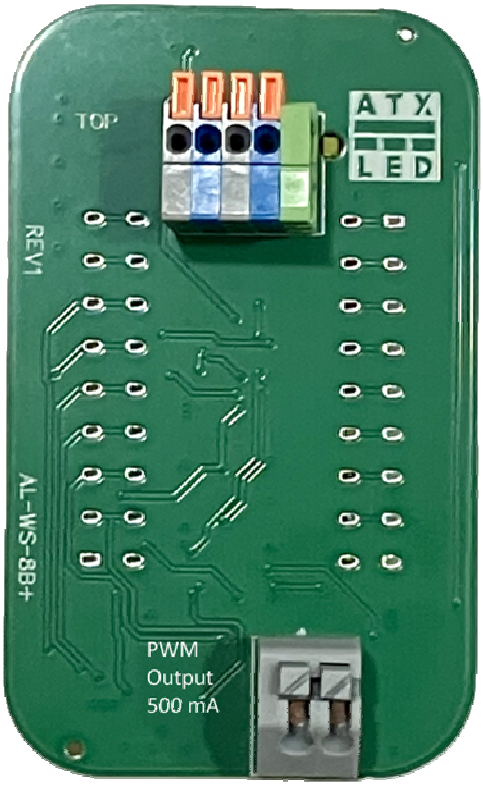
Relay option: AL-DA-IO16 (sml version)

See our AL-DA-IO16 in the structured media enclosure sml© case. This allows a voltage or contact to be monitored, and a relay output to be activated

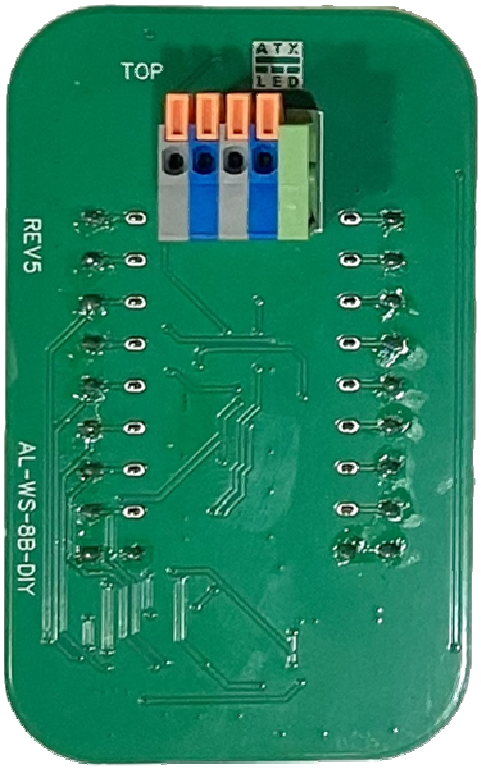
Specifications

AL-WS-8B1P

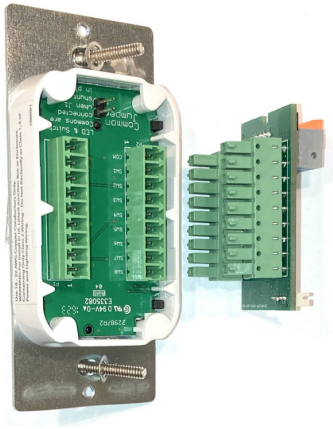
Power requirements	DA pins - DALI bus – 8 ma max (all LEDs on)
Input Voltage (DALI bus)	14 to 24 volts – (DALI Bus)
Power consumption	120 milliwatts @ 15 volts (all leds on)
Protection	Reverse protection and static protection on all pins
Static Electricity	Ground Metal plate to protect from Static Discharge – please ground it.
Operating Temperature	0°C ~ 50°C
Size	108H (metal) 70H x 34 D x 42 W mm
Receive Addressing	DALI master assigns the address
Transmit addressing	DALI standard 8 and 16 bits.
DALI BUS interface	DA Bus In and Out – 300 mA max AWG 18-24 gauge wire, spring terminals
Connectors	KF141V type – color coded
PWM Isolated Output Driver	500 mA, 60V, AC/DC output Connected to LED #1 requires 500 uA when on
0-10v Isolated output via PWM	Connect the PWM pins to the 0-10v signal
OEM version Output Current	Each output LED requires 2 mA when On. Common Ground
OEM version Input contact	Less than 100 uA, common ground



AL-WS-8B

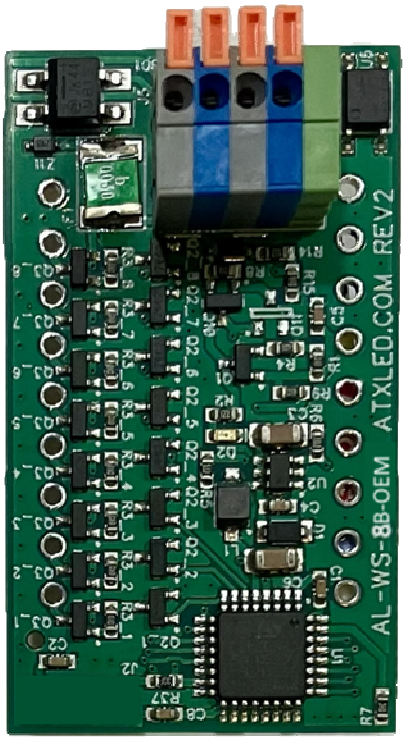


Legrand LVSW



AL-WS-8B

AL-WS-8B-OEM



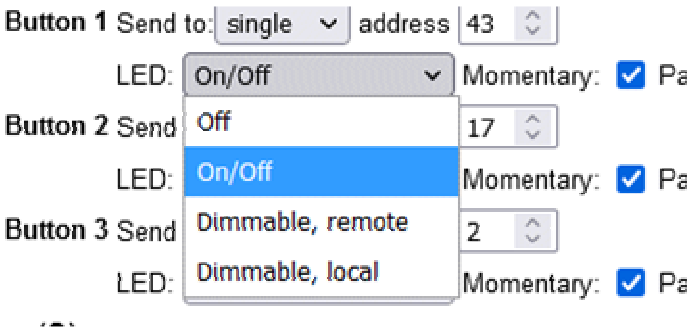
Embed this OEM version behind any switch

Ordering part numbers

Model	Number of Buttons
AL-WS-010v	1
AL-WS-2B	2
AL-WS-3B	3
AL-WS-4B	4
AL-WS-8B	8
AL-WS-8B-DIY bring your own LVSW	8 Module Only
AL-WS-8B1P	8 plus LED output
AL-WS-8B-OEM	8 in 8 out
AL-DA-Relay8	SML – high current
AL-DA-IO16	SML I/O version

Hardware Option – 1 PWM output

Use the AL-WS-8B1P to add a single power output for a LED to the 1 gang box with the LVSW. Great for upgrades to replace an AL-WS-M with a smart switch and one additional LED control. This output can control 500 mA of load, up to 60v AC or DC can be switched.



The control setting for Button 1 is Dimmable, remote to enable LED or Motor operation – connection made turns LED on

Set to Dimmable, Local for inverted operation for 0-10v control (connection turns 0-10v to zero)

DALI Operation – Base Address

Using any DALI master, assign the AL-WS-8B a DALI address. This is not the address of the buttons, this is the address of the module that controls the buttons. At this address the following functions are supported

- Change the address of each button (single, group, scene, broadcast)
- Set the operating mode of each button
- Set LED on time in seconds, including always ON, for all buttons
- Set LED brightness including OFF
- reset the device to defaults

The device responds to the provisioning commands from a DALI controller. 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 DALI Master such as the ATX LED Hub. Once a short address is assigned – the device can be understood to operate as nine devices in one. The DALI bus address is only used to write and store configuration commands for all buttons, the 8 additional addresses can be assigned as needed. A DALI master can write the configuration commands using the DALI write user memory commands. Note – when transmitting from the AL-WS-8B to it's own address, for example a brightness change, no internal action task place.

DALI Operation – Button Example

Each button can be programmed– for example with an 8 button switch:

- pairwise example: top left button is broadcast on with dim up and next one down is broadcast dim down or OFF
- top right button is ON for address 3, press to dim up. Button below that is OFF for address 3, press to dim down
- 3rd row is group 0 (left) and short address 1 (right). Each will send On/ Off/ Dim to the defined address.
- the bottom two are scene 1 recall (left) and right is scene 6 recall (right), both the undo enabled

DALI Operation – Simple Button Programming

After the Base address is assigned a Short DALI Address, the user can program each button as needed. Example: if the base address is 20, then the top left transmits to SA 20 by default, the other buttons are group 1 to 7. All can be changed as needed.

- On – press briefly – the light will turn on immediately
- Off – press briefly – the light will turn off when the button is released
- Press and hold. to dim is supported. If this is acceptable to you – nothing more needs to be done.

These individual button functions can be changed on a per button basis – no sequence is required. You can set any individual address, group DALI address or a unique Scene recall function, in any order to any button.

DALI Operation – values learned from Drivers

At the first time a button is pressed (after power up, or when the address is changed) the AL-WS-8B will read the Minimum and Maximum dim levels, the current level, and the group associations from the driver at each address to learn the range for the dimming function. The level at that address is saved for the next dimming action starting point.

Advanced DALI Operation – paired Button Programming

In 2 button per address mode – Buttons 1, 3, 5, 7 can be assigned as UP only (with Dim Up only), while buttons 2, 4, 6, 8 can be assigned as Off (with dim down only). This is called the Pairwise setting – you can mix pairwise with regular in one LVSW

Advanced Individual Button Programming

Using memory Bank 0, locations 21 thru 36 addressed by the DALI protocol in the AL-WS-8B, we can assign a function and address to each button and LED. A button has a number between 1 and 8. These can be stand alone, or can be pairwise. If stand alone – each button has a unique destination. If pairwise, then one is On/Up dim and adjacent is Off / Down dim.

Memory Locations in the memory bank 0 – Table 1

Button #	Mode – Table 2	Destination - Table 3	Scene Destination – Table 4
1	21	22	37
2	23	24	38
3	25	26	39
4	27	28	40
5	29	30	41
6	31	32	42
7	33	34	43
8	35	36	44

Mode Bits – Table 2

7	6	5	4	3	2	1	0
Momentary	LED Mode A	LED Mode B	Switch Mode	Broadcast	Scene (0-15)	Group (0-15)	Single address
				1 = enable 0 = disable	1 = enable 0 = disable	1 = enable 0 = disable	1 = enable 0 = disable
0			0	Input On / Off sends DALI On / Off (no dimming)			
0			1	Vacancy Mode -> When input goes from 0->1, ignored: each 1->0 transition delays turn off another 20 seconds of no activity			
1			0	Push button, Toggle On/Off, press and hold to dim down then up			
1			1	Odd numbered buttons press to turn ON – hold to dim up. Even numbered buttons hold to dim down, don't hold to turn OFF			
	0	0	Internal LED off				
	0	1	Remote: LEDs follow DALI bus brightness at short or group address				
	1	0	Local: LEDs follow button brightness				
	1	1	Internal LED On/Off with timeout (DALI cmd 46)				

Destination Address – Table 3

Mode	7	6	5	4	3	2	1	0
Single	0	0	SA5	SA4	SA3	SA2	SA1	SA0
Trigger*	0	1	0	0	T3	T2	T1	T0
Toggle*	0	1	0	1	T3	T2	T1	T0
Group	0	0	0	0	G3	G2	G1	G0
Scene	0	0	0	Undo*	S3	S2	S1	S0
Broadcast	1	0	0	0	Smart	Off Only	On Only	On/Off

- **Single** means a button press sends DALI ARC brightness level to Address 0-63.
- **Triggers** send a DALI command 271 (0xBF) with data byte = 0-15
- **Toggles** send a DALI command 271 (0xBF) with data byte = 16 + 0-15 + On/Off * 16, synced with other Triggers
- **Group** sends a DALI ARC brightness level to 0-15 groups.
- **Scene** recalls pre-stored scene number 0-15.
- **Scene** Undo stores the existing state of the lights into Scene 15, so a user can undo a Scene within 6 seconds.
- **Broadcast** modes are Off, On, On/Off and Smart.
- **Smart** Broadcast means Off if any lights are on, if all lights are off, send scene #14 recall.

(* requires FW 21)

Scene Undo Mode

The Scene option supports an undo mode. If a button programmed for Scene undo is pressed, all the light on/off/dim/cct levels will first be saved as scene 15, then the 8B will trigger the requested scene. If the same button is pressed within 5 seconds – Scene 15 (the previously stored scene) will be set, restoring the lights to the prior setting.

Scene Destination Address – Table 4

Function	Value	Bus Range
Individual	0-63	0-63
Group	64-79	Group 0-63
Broadcast	127	All devices

Requires FW 16

Smart Broadcast Mode

The Smart mode listens to DALI bus commands and if any light has been turned on, it will send a broadcast off command. If all lights are off, it will send a Scene 14 command. This allows a single button at the front door to turn all lights off on exit, and a preset scene 14 on return. Smart modes need version 12 or later. Smart Mode is numeric 136.

Virtual 3-Way Operation

The Virtual method listens and maintains sync with devices at same short or group address. This means that each AL-WS-8B will decide using the existing On/Off state of the driver before sending an On/Off command when a button is pressed. The result allows unlimited numbers of switches to dim and control a common light. All ATX LED switches support Virtual 3-way. Scene sync requires version 12 or later.

The level recorded is either the level sent to the short address of the button, or to a group containing that short address. If a scene control on the bus is detected, then the destination address or group will be queried before transmitting the level.

Push Button vs On/Off mode

Most users should use Push Button Toggle mode. This supports 3-Way and other features.

If you prefer that the buttons are controlled by your DALI master instead of by the logic in the switch – then disable the push button toggle mode – each switch will send a DALI ARC level command of 0 or non-zero for off and On. The non-zero value will be the last ARC level sent to that address. When Push Button mode is disabled (On/Off) mode – the buttons do not control the built in LED outputs directly. these LED outputs respond only to ARC commands from the DALI bus.

Internal LED timeouts

Each button has an LED. These default to be set to display the brightness of the LED driver at that address. If the destination is ON, pressing the button will turn the destination OFF and the LED will flash for ½ second. If the destination is OFF, pressing the button will turn the destination ON and LED will stay on a programmable duration, the default is 4 seconds – then the LED turns off. Set the DALI command “Fade Time” using the base address to set the ON time. See Brightness for ON/Off/Dim levels.

Internal LED brightness

There are 4 brightness options in addition to the On time option. The brightness is controlled by PWM to the LED at a rate of 125 Hz with 8 steps. The On time is defined by the DALI Fade Time command.

- The LEDs can be set to be OFF all the time
- Local mode - The brightness of the LED will track the levels sent by the button to the destination address, or by the ARC level sent by a DALI master to the address or group assigned to the button.
- Common mode - ALL LEDs can be set to a common brightness level defined by the level sent to the base address
- The LEDs can be On/Off only without dimming

Note: the LEDs will follow the state of the button inputs in momentary mode only. If the AL-WS-8B-OEM is used in rocker mode – the LEDs will not track the input switches – send level commands to that DALI address to control the outputs.

DALI Commands Supported by the AL-WS-8B at it's own short address

ARC		ARC level 0-254	See LED brightness if Global
	32	Reset to defaults (don't change Short Address)	
	42	Set all 8 buttons to this Max level	Default 254
	43	Set all 8 buttons to this Min level	Default 0
	46	Set LED On Time in seconds (See DALI fade time table)	0= Off, 15 = always on
	47	Set Vacancy Detection time (DALI fade time table, x 40)	0 to 3600 seconds
	128	Set Short Address	
	129	Enable Memory Write	
	144	Read Status	
	145	Ping address	255
	147	Query On/Off of button # from DTReg2	
	149	Query reset state	
	150	Query missing short address	255 is missing
	151	Dali Version	1
	152	Read current DTReg	
	153	Query DALI ballast type supported	6
	155	Query power fail status	255 if rebooted
	156	Query DTReg1	
	157	Query DTReg2	
	160	Query ARC Level global LED	
	161	Query Max level global LED	
	162	Query Min level global LED	
	165	Query LED On Time and Vacancy time	Bits 0-3 = Vacancy Bits 4-7 = LED
	166	ATX LED HW Type	10
	192	Query Group 0-7 for Global LED control	
	193	Query Group 8-15 for Global LED control	
	194/5/6	Query Random High/Middle/Low bits	
	197	Query Memory Bank	address DTR1:DTR
A1	256	Terminate	
A3	257	Set DTR	
A5	258	Initial Addressing Mode	
A7	259	Randomize	
A9	260	Compare Random Address	
AB	261	Withdraw from Random Addressing	
	264 / 265 266	Set High / Middle / Low Byte	B1, B3, B5
B7	267	Set Short Address if match	
B9	268	Query Short Address	
BB	269	Query Long Address Match	
C3	273 / 274	Set DTReg1 / DTReg2	
C7	275	Write Data at Memory Bank DTR1:DTR	Send Confirm
C9	276	Write Data at Memory Bank DTR1:DTR	No Response
64-71		Emulate a Button press – allows SW based regression testing	Individual address only – not bcst
96-111		Add to Group	For Global LED Control
112-127		Remove from Group	For Global LED Control

Memory Bank 0

Address	Bank 0 Name	Bank 0 Value
0	Bytes per Bank (minus 1)	63
1	Checksum	Calculated
2	Number of Banks (minus 1)	3
3	UPC code – msb	722512406476
4	UPC code	
5	UPC code	
6	UPC code	
7	UPC code	
8	UPC code – lsb	
9	FW Version	
10	HW Version	
11	Serial Number – msb	Assigned by Master
12	Serial Number	
13	Serial Number	
14	Serial Number – lsb	
16	# of buttons	1, 2, 3, 4, or 8
21-44	Button Mode	See table
45-63	User data	

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

Address	Name	Value
3	Up Time	Hours (LSB)
4	Up Time	Hours (MSB)

Advanced individual Button Modes

DALI bus Commands interpreted at addresses/groups assigned to buttons allows sync'd and expected actions on button presses.

	ARC	Copy ARC Level for 3-way processing for Address, Groups, Broadcast	
	0	Status LED Off	
	1	Status LED UP 8 steps	
	2	Status LED Down 8 steps	
	3	Status LED UP one step but don't turn on	
	4	Status LED Down one step but not off	
	5	Status LED Set to MAX level	
	6	Status LED Set to Min level	
	7	Status LED Down one step and Off if needed	
	8	Status LED Up one step or on if needed	
	33	Save level in DTReg	
	42	Store DTR as new Max Level	
	43	Store DTR as new Min Level	
	96-111	Add to Group	Virtual 3-way sync
	112-127	Remove from Group	Virtual 3-way sync
	171	Query presence of AL-WS-8B at this address, report level	
	257	Load DTR	
	271	This is sent out to the bus if the mode is set for Target mode	

Major Revision Changes

Version	New Feature	Previous Action
23	Support LED output 500 mA driver Support Local / Remote LED control	
22	Group transmit are processed locally too	Local group members could be out of sync
21	Trigger Toggle listen	On/Off state could be out of sync
20	Able to turn onboard LEDs off	Dim only, not off
19	Add On/Off to 271 trigger actions	On / Off state not sent
18	Allow Scene recall to Individual or Groups	Broadcast only
16	Add Test Button feature for regression testing	
16	Readback Destination level if Scene might have changed it	
16	Fix dim up / dim down on long press	Bug in V14
15	Add 271 (0xBF) command	
14	Start button dimming from destination ARC level if Destination was ON	
V13	Add Scene Undo	
V11	Add Broadcast modes	
V11	Add 172 to query SA owner	
V9	Timeout feature for status LED	
V4	Don’t resend on Backward packet collision	