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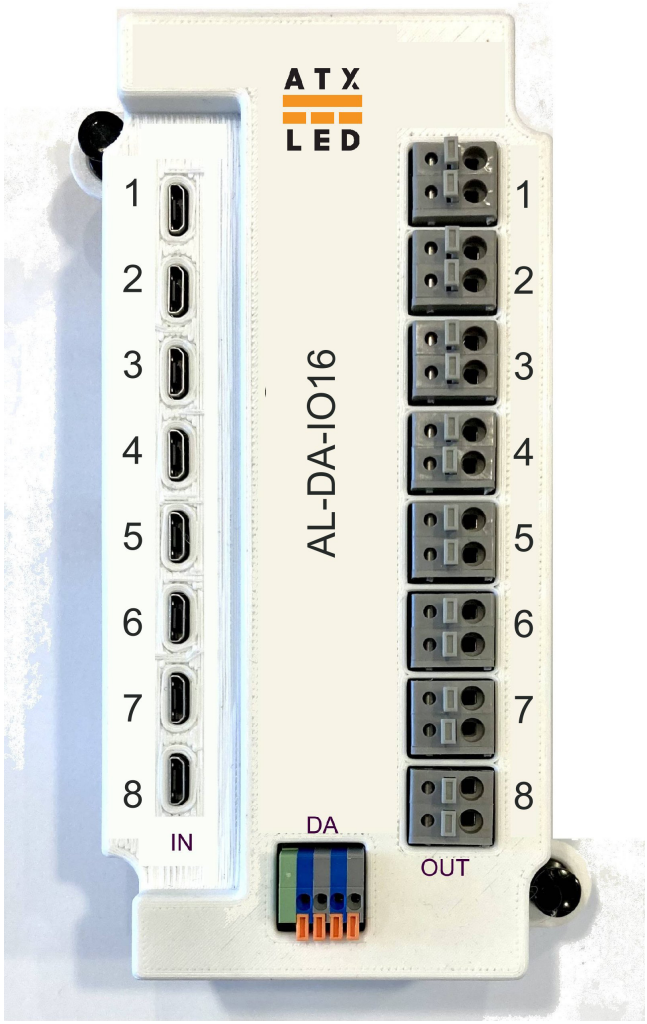
AL-DA-IO16

General Purpose IO module



Product Description - GPIO device for DALI

This device has these features

- 8 voltage sensing or contract sensing inputs
- 8 isolated outputs with 60v and 1 amp each

Using these features – each input can:

- create a DALI individual address command
- create a DALI Group command
- trigger a DALI scene be recalOutput.
- the above can be mixed
- using our ZWD software package – each input can be configured to “trigger” complex actions

Specifications

	DA pins - DALI bus – 8 ma max
Power requirements	
Input Voltage (DALI bus)	14 to 24 volts – (DALI Bus)
Input Voltage (logic input)	5v to 12v via microUSB – presence sends a ON command, Off is sent when power is removed 1 mA at 5v, 4 mA at 12v, 20v maximum not isolated
Input Contact detection	Internal pullup to 3.3 volts, 1 mA. Short to Ground for a ON signal not isolated
Output Driver ability	60v AC/DC output solid state isolated relay AL-DALI-IO16 uses the TLP172 with PWM support and 300 mA, 1 ohm AL-DALI-Relay8 uses the AQY212GS with On/Off only and 1000 mA, 0.1 ohm
Power consumption	64 milliwatts @ 15 volts plus the
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	Sml standard 70 mm x 147mm x 30mm plus 2x 10mm interleaving tabs on the 70mm side
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	DALI KF141V type – color coded input - MicroUSB 5 pin Output – KF246 sping loaded connectors

Powering the AL-DALI-IO16, Relay8

Power the switch via the DA pins, it needs about 1.5 mA to operate, plus about 2 mA for each output 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.

Inputs to the AL-DALI-IO16

Each input can be assigned an individual function – see the commands shown below. You can set individual, group, scene or broadcast actions to each input. You can also change the inputs to simply send their On/Off status. By default – all inputs operate in Broadcast mode. Note – there is a ground path from the inputs to the DALI bus – be mindful of that. Only use isolated contact or isolated 5v or 12v sources

The device can sense

a) +5 volts on the Micro USB input – for example, a 120v signal can be converted to 5 volt using a low cost phone charger – a USB to micro USB cable then sends a signal to the IO16 that power is applied

b) A contact closure can be detected between pins 3 and 5 of the micro USB connector

Outputs from the AL-WS-DALI-IO16, Relay8

The DALI-IO16 version has 8 high speed PWM capable AC or DC compatible 300 mA solid state On/Off/Dim relays. The DALI-Relay8 version has 8 slow speed AC or DC compatible 1000 mA On/Off solid state relays. Both offer 60 volt tolerance when off. The Relay outputs are control by DALI ARC commands with Full ON, Full OFF (or dimming with PWM*).

DALI Operation – Base Address

Using any DALI master, assign the AL-DALI-IO16 a DALI address. This is not the address of the inputs, this is the address of the module that controls the inputs. At this address the following functions are supported

- Set Output on time in seconds, including always ON
- Set Output brightness including OFF
- Change from default sequential individual address to sequential group
- Set the operating mode of each input (On/Off or Momentary)
- Change the address of each input and output
- 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 AL-DALI-PI. Once a short address is assigned – the device can be understood to operate as nine devices in one. This is only used to write and store configuration commands. A DALI master can write the configuration commands using the DALI write user memory commands.

DALI Operation – Simple Input Programming

Factory default is for the 1 inputs to each generate a Scene command (Scene 1 thru 8) when a signal is detected.

After the Base address is assigned a Short DALI Address, the user can use ZWD or a DALI master to set the inputs 1 to 8 these modes:

- Individual
- are set to generate sequential addresses up from the base address +1. On/ Off is the default. If the base is 20, then the top transmits to SA 21, the bottom to SA 28. If this is acceptable to you – nothing more needs to be done.

  Assigning the base address to a group will cause the inputs to be programmed to that group number + n. With the base set to group 5, top input 1 will send ON commands to group 5, 2 to 6, 3 to 7 and 8 to 12.

These individual input functions can be changed on a per input 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 input.

DALI Operation – values learned from Drivers

At the first time a input is pressed (after power up, or when the address is changed) the AL-DALI-IO16 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. If there is no response, the DALI defaults will be used.

Advanced Individual Button Programming

Using memory 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 (btn) between 1 and 8. If only one button is set to an address – then the button is in single button mode (On/Off toggle, Press to dim down, then up: If two buttons are set to an address, then one is On/Up dim and the other is Off / Down dim.

Mode Bits: (bank address 19 + button*2)

7	6	5	4	3	2	1	0
Input Momentary	OUTPUT Mode A	OUTPUT Mode B	Input Pairwise / Vacancy	Send Broadcast	Send Scene	Send Group	Send Single

Momentary	Pairwise/ Vacancy	Function
0	0	For use with On/Off switches
0	1	When input goes from 0->1, ignored: each 1->0 transition re-triggers a turn off after 20 seconds of no activity
1	0	For use with momentary switches, up to 8 toggle push buttons
1	1	Odd numbered buttons press to turn ON – hold to dim up. Even numbered buttons press to turn OFF – hold to dim down

Led Mode	Led On/ Off	Dimming	On Time
A=0, B=0	Off	-	-
A=0, B=1	Dimmable	Individual	DALI command 46*
A=1, B=0	Dimmable	Global	DALI command 46*
A=1, B=1	On/OFF	-	DALI command 46*
	* when set to 15 – LED matches Address On/Off , otherwise the ON time is according to DALI standards.		

Address: (bank address 20 + input*2)

7	6	5	4	3	2	1	0
		SA5	SA4	SA3	SA2	SA1	SA0
				G3	G2	G1	G0
				S3	S2	S1	S0

When working with the AL-DALI-Pi, please use the python script “Address_DALI8.py” from our web site. This will allow you to program the multi switch easily. http://atxOutput.com/Pi/

Virtual 3-Way Operation

The Virtual method listens to DALI bus traffic in the same short or group address. Using the Virtual method just means that each AL-DALI-IO16 will use the existing On/Off state of the driver before sending an On/Off command when a input is pressed. The result allows unlimited numbers of switches to dim and control a common light. All ATX OUTPUT switches support Virtual 3-way.

The level recorded is either the level sent to the short address of the input, or to a group containing that short address.

Toggle vs On/Off mode

Most users should use the ON/Off Input mode. This will create a simple DALI command for each On and Off action, virtual 3-Way is not supported. If you prefer that the inputs are controlled by your DALI master instead of by the logic in the switch – then disable the 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. In On/Off mode – the inputs do not control the Outputs directly. The Outputs respond only to ARC commands from the DALI bus.

If Toggle is used, this supports 3-Way and other features.

OUTPUT timeouts on the AL-DALI-IO16

Each input has a corresponding OUTPUT. These default to be set to display the brightness of the OUTPUT driver at that address. The ON time is programmable, default is 4 seconds – then the OUTPUT turns off. Set the DALI command "Fade Time" using the base address to set the ON time. See Brightness for ON/Off/Dim levels.

OUTPUT brightness – local, off

There are 4 brightness options in addition to the On time option. The OUTPUTs can be set to be OFF all the time, or to follow the level of the driver at the address of each input (local operation). The Brightness of the OUTPUT will track the levels sent by the input to the destination address, or by the ARC level sent by a DALI master to the address or group assigned to the input. The brightness is controlOutput by PWM to the OUTPUT at a rate of 200 Hz with 8 steps. The On time is defined by the DALI Fade Time command.

OUTPUT brightness – remote

The OUTPUTs can be set to a common brightness level. Send an ARC level to the base address, and all the OUTPUTs will show this brightness. The brightness is controlOutput by PWM to the OUTPUT at a rate of 200 Hz with 8 steps. The On time is defined by the DALI Fade Time command.

OUTPUT brightness – On/Off

The OUTPUTs can be simply On or Off with no dimming. If an ARC Level is sent to the address, the OUTPUT will be turned On for XX seconds if the ARC level is non zero.

DALI Commands Supported
Base Address

Notes: * = must be sent twice in 100ms,

ARC	ARC level 0-254	See OUTPUT brightness if Remote
32	Reset to defaults (don't change Short Address)	
42	Set all 8 inputs to this Max level	Default 254
43	Set all 8 inputs to this Min level	Default 0
46	Set OUTPUT On Time	See DALI fade time table 15 = always on

128	Set Short Address		
129	Enable Memory Write		
144	Read Status		
145	Ping address	255	
147	Query On/Off of input # 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 of input # from DTReg2		
161	Query Max level of input # from DTReg2		
162	Query Min level of input # from DTReg2		
165	Query Fade Time	Setting * 16	
166	ATX OUTPUT HW Type	10	
194	Query Random High bits		
195	Query Random Middle bits		
196	Query Random Low bits		
197	Query Memory Bank address DTR1:DTR		
	Global DALI commands		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
273	Set DTReg1		C3
274	Set DTReg2		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	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	722512406087
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 inputs	1, 2, 3, 4, or 8
21-36	Input Mode	See table
37-63	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	

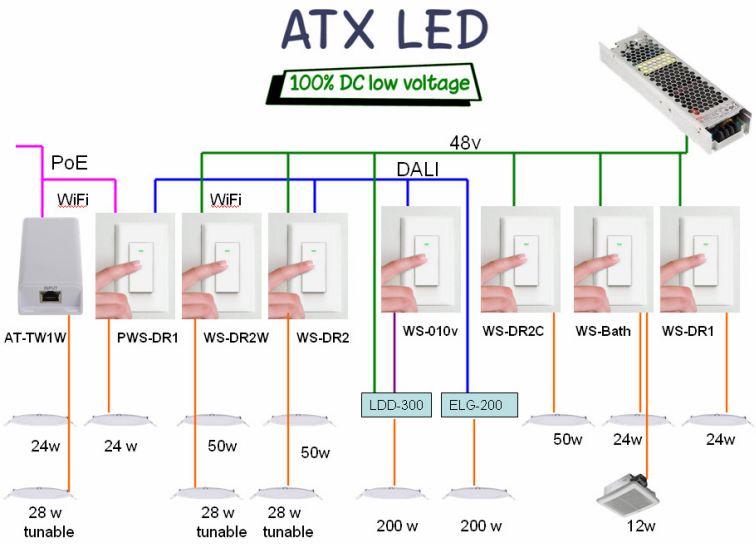
Memory Bank 4 (read only)

Address	Name	Value
3	Up Time	Hours / 256
4	Up Time	Hours (8 years max)

Advanced individual Input Modes

DALI Commands Supported
at address/groups assigned to inputs

ARC	Copy ARC Level for 3-way processing for Address, Groups, Broadcast	
0	Status OUTPUT Off	
1	Status OUTPUT UP 8 steps	
2	Status OUTPUT Down 8 steps	
3	Status OUTPUT UP one step but don't turn on	
4	Status OUTPUT Down one step but not off	
5	Status OUTPUT Set to MAX level	
6	Status OUTPUT Set to Min level	
7	Status OUTPUT Down one step and Off if needed	
8	Status OUTPUT 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	For 3-way sync
112-127	Remove from Group	For 3-way sync
171	Query presence of AL-DALI-IO16 channel at this address, report level	
172	Query the short address AL-DALI-IO16 hosting this address	
257	Load DTR	



Ordering part numbers

Model	UPC
AL-DALI-IO16	722512406087
AL-DALI-Relay8	722512407367