

# LightSwarm

## 64 and 32 Channel Lighting Controller

**LS-D64P400**  
**LS-D32P400**



The **LS-D64P400** and **LS-D32P400** are microprocessor controlled 64 and 32 channel lighting systems designed to control LED and incandescent lighting in architectural models, exhibitions displays, and any environment requiring multiple channels of independently controlled lighting.

The **LS-D64P400** and **LS-D32P400** have been specifically designed to drive large numbers of LED lighting channels. Each of the channels can simultaneously drive loads of up to 400 milli-amps at 12 volts. Combinations of different LED types can be connected to the same module, including conventional white LEDs, colored LEDs, and RGB LEDs. Incandescent lighting can also be controlled. The outputs can also be used to drive electromechanical and solid state relays, and other devices that require a 12 Volt signal to operate.

The **LS-D64P400** and **LS-D32P400** are members of the LightSwarm family of modules. LightSwarm modules share a common communication bus that allows multiple devices to be controlled easily by one or more master stations.

Commands sent to the module control the turning on and off of channels, setting the brightness level, commencing automatic fade-up and fade-down sequences, and other effects. Each channel can be programmed with pseudo-addresses that allow a

- 64 and 32 Channel LED lighting controller for models and exhibition displays.
- Remote control of individual channels including programmable brightness and timed fade sequences.
- Each channel can drive 400 mA at 12 volts
- LED indicators for status of each channel.
- Multiple modules can be daisy-chained together to control thousands of lights.
- Modules can be mixed with other devices that support the LightSwarm protocol.
- Industrially designed for mounting inside models and displays.
- Modules can be remotely controlled and distributed around large display suites.
- Can be controlled from PCs, handheld keypads, and other devices.

channel to take on multiple identities. This allows one command to be received and activated by many channels distributed across multiple modules.

Brightness control is achieved using Pulse Width Modulation (PWM). PWM is a technique whereby the outputs are turned on and off at high speed. The longer the time that the channel is off, the lower the apparent brightness. The switching frequency is higher than the eye can perceive, and therefore gives the appearance that the light is on continuously, but at a lower brightness level.

Other members of the LightSwarm family include programmable wireless keypads that can control complex lighting effects from the touch of a button, wired keypads, audio playback modules, and USB interfaces for PC touch screen displays. A range of cable management solutions is also available, simplifying the construction of models and displays when large numbers of lighting channels are used.

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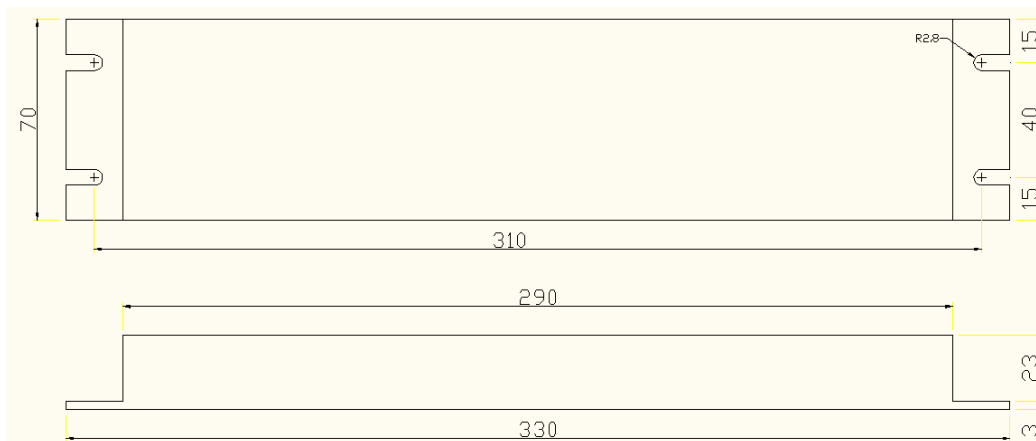
## Technical Details

Number of channels:	64 (LS-D64P400), 32(LS-D32P400)
Operating Voltage:	12 volts DC nominal (10 to 14 volts DC)
Maximum current per channel:	LED: 400 milli-amps at 12 volts DC (4.8 watts) Incandescent: 300 milli-amps at 12 volts DC (3 watts)
Power Consumption (internal electronics):	450mA (sourced from channels 0-31 power input) 300mA (sourced from channels 32-64 power input)
Power Configuration:	2 power supply inputs, one for each group of 32 channels
Power Protection:	2 x in-line blade fuse holders supplied.
Pulse Width Modulation:	256 steps, 150 Hz
Fade Control:	Fade up/down to level with 1/100 second steps
Switching:	Low-Side switching (common positive rail)
Dimensions:	(W) 310mm x (H) 70mm x (D) 26mm
Interface:	2 x RJ25 LightSwarm bus interfaces 4 x 34 way ribbon cable connector sockets
LightSwarm Bus baud rate:	9600, 38,400 and 128,000 bps
Construction:	Black anodized 3mm mounting plate and fascia.
Indicators:	64 LEDs show status of each channel (32 LEDs on LS-D32P400) LEDs for power indication, heartbeat, bus activity, and fault
Number of pseudo-addresses:	64 per channel

## Shipping Contents

Each **LS-D64P400** is supplied with 2 DC power input screw terminal plugs, 2 in-line fuse assemblies, a selection of fuses, and a LightSwarm bus interface cable. Each **LS-D32P400** is supplied with one DC power input screw terminal plugs, one in-line fuse assemblies, a selection of fuses, and a LightSwarm bus interface cable.

## Mechanical Layout



## LightSwarm bus

The LightSwarm bus is a 4 wire interface that multiple LightSwarm modules connect to for communications purposes. A bus will typically have one or more master devices (e.g. a handheld keypad), and one or more slave devices such as a **LS-D64P400** lighting controller.

The bus is physically similar to modular connectors used on telephone systems. The electrical levels are RS485 compliant. The protocol is a propriety protocol designed specifically for architectural and lighting display systems. It is a highly efficient and simple protocol, minimizing the overheads required by master devices. Most programmers familiar with Visual Basic would be able to create kiosk style touch screen controllers that interface to the bus.

## Addressing

The **LS-D64P400** and **LS-D32P400** occupy 64 addresses within the protocol address range. A DIP switch sets one of 256 base addresses that range from 0 to 4,080. The channel address is calculated by adding the channel number to the base address. For example, if the base address is set to 240, then the addressable range for a 16 channel module is 240 to 255. Therefore, up to 256 **LS-D16P3000** LightSwarm modules can co-exist in a single system, providing 4,096 lighting channels, without overlapping addresses.

The **LS-D32P400** only uses 32 of the 64 channels in the address range, however the DIP switch only allows the base address to be set in increments of 64. The upper 32 addresses are available for other devices on the bus to use.

Combinations of different types of LightSwarm modules can share the same bus, extending the number of available channels to much higher levels.

## LightSwarm Commands

The **LS-D64P400** and **LS-D32P400** supports the following LightSwarm protocol commands:

MDP_ON	Set channel on
MDP_OFF	Set channel off
MDP_LEVEL	Set channel level
MDP_FADE	Set channel fade
MDP_PADDSET	Set channel pseudo address
MDP_PADDERASE	Erase channel pseudo address table

## Configuration Switch Settings

Address Switch (Switch 1 to 8)

C = Closed (or "ON"), O = Open

Switch Number		Address	Switch Number		Address	Switch Number		Address	Switch Number		Address																				
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
		0 to 63			4096 to 4159			8192 to 8255			12288 to 12351			12288 to 12351																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		64 to 127			4160 to 4223			8256 to 8319			12352 to 12415			12352 to 12415																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		128 to 191			4224 to 4287			8320 to 8383			12416 to 12479			12416 to 12479																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		192 to 255			4288 to 4351			8384 to 8447			12480 to 12543			12480 to 12543																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		256 to 319			4352 to 4415			8448 to 8511			12544 to 12607			12544 to 12607																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		320 to 383			4416 to 4479			8512 to 8575			12608 to 12671			12608 to 12671																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		384 to 447			4480 to 4543			8576 to 8639			12672 to 12735			12672 to 12735																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		448 to 511			4544 to 4607			8640 to 8703			12736 to 12799			12736 to 12799																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		512 to 575			4608 to 4671			8704 to 8767			12800 to 12863			12800 to 12863																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		576 to 639			4672 to 4735			8768 to 8831			12864 to 12927			12864 to 12927																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		640 to 703			4736 to 4799			8832 to 8895			12928 to 12991			12928 to 12991																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		704 to 767			4800 to 4863			8896 to 8959			12992 to 13055			12992 to 13055																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		768 to 831			4864 to 4927			8960 to 9023			13056 to 13119			13056 to 13119																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		832 to 895			4928 to 4991			9024 to 9087			13120 to 13183			13120 to 13183																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		896 to 959			4992 to 5055			9088 to 9151			13184 to 13247			13184 to 13247																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		960 to 1023			5056 to 5119			9152 to 9215			13248 to 13311			13248 to 13311																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1024 to 1087			5120 to 5183			9216 to 9279			13312 to 13375			13312 to 13375																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1088 to 1151			5184 to 5247			9280 to 9343			13376 to 13439			13376 to 13439																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1152 to 1215			5248 to 5311			9344 to 9407			13440 to 13503			13440 to 13503																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1216 to 1279			5312 to 5375			9408 to 9471			13504 to 13567			13504 to 13567																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1280 to 1343			5376 to 5439			9472 to 9535			13568 to 13631			13568 to 13631																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1344 to 1407			5440 to 5503			9536 to 9599			13632 to 13695			13632 to 13695																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1408 to 1471			5504 to 5567			9600 to 9663			13696 to 13759			13696 to 13759																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1472 to 1535			5568 to 5631			9664 to 9727			13760 to 13823			13760 to 13823																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1536 to 1599			5632 to 5695			9728 to 9791			13824 to 13887			13824 to 13887																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1600 to 1663			5696 to 5759			9792 to 9855			13888 to 13951			13888 to 13951																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1664 to 1727			5760 to 5823			9856 to 9919			13952 to 14015			13952 to 14015																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1728 to 1791			5824 to 5887			9920 to 9983			14016 to 14079			14016 to 14079																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1792 to 1855			5888 to 5951			9984 to 10047			14080 to 14143			14080 to 14143																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1856 to 1919			5952 to 6015			10048 to 10111			14144 to 14207			14144 to 14207																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1920 to 1983			6016 to 6079			10112 to 10175			14208 to 14271			14208 to 14271																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		1984 to 2047			6080 to 6143			10176 to 10239			14272 to 14335			14272 to 14335																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2048 to 2111			6144 to 6207			10240 to 10303			14336 to 14399			14336 to 14399																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2112 to 2175			6208 to 6271			10304 to 10367			14400 to 14463			14400 to 14463																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2176 to 2239			6272 to 6335			10368 to 10431			14464 to 14527			14464 to 14527																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2240 to 2303			6336 to 6399			10432 to 10495			14528 to 14591			14528 to 14591																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2304 to 2367			6400 to 6463			10496 to 10559			14592 to 14655			14592 to 14655																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2368 to 2431			6464 to 6527			10560 to 10623			14656 to 14719			14656 to 14719																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2432 to 2495			6528 to 6591			10624 to 10687			14720 to 14783			14720 to 14783																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2496 to 2559			6592 to 6655			10688 to 10751			14784 to 14847			14784 to 14847																	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
		2560 to 2623			6656 to 6719			10752 to 10815			14																				

## Terminal Connections

The **LS-D32P400** is physically and electrically identical to the **LS-D64P400**, with the exception that the internal electronics is only installed for the first 32 channels, and the additional 32 channels are vacant. For the purposes of this datasheet, the **LS-D64P400** will be referred to.

The **LS-D64P400** is provided with three sets of connectors:

- 2 x LightSwarm Bus interface connections (RJ25)
- 2 x 2 way DC power connections for supplying 12V DC
- 4 x 34 way ribbon cable connectors for channel outputs

The power supply to the channels is separated into two groups:

- Channels 0 to 31 and the common control electronics is powered by the first power w-pin connection that is located adjacent to the RJ25 connectors.
- Channels 32 to 64 are powered by the other 2-pin connector.

The channel outputs are connected via 34 way ribbon cable IDC (Insulation Displacement Connector) sockets. Each of the connectors provides 16 channels, with each channel having 2 wires. Therefore a total of 32 wires are required. The additional 2 wires (number 33 and 34) are not used. On some cables these additional wires may not be installed on the connectors.

It is recommended that if a ribbon cable is used with a connector on one end only, that the additional two wires should be stripped back to the connector and cut-off. This will avoid confusion when wiring to the lighting devices.

Pin 1 of the connector and each additional odd pin-number are the switched ground outputs, and pin 2 and each even numbered pin are the common +12 volt outputs.

Pin 1 of the cable often has a coloured stripe identifying that it is the first pin.

The table shows the pin connections on the 34 way connectors.

Each channel has an output capacity of 400 milli-amps per channel. Therefore a maximum of 12.8 Amps can be supplied to each block of 32 channels, plus an additional 450mA for channels 0-31, and an additional 300mA for channels 32-63. The current rating of each channel must not be exceeded, as this could damage the modules.

Currents at these levels can cause serious faults if appropriate protection circuitry is not included. **An in-line fuse should be connected from the power supply to each of the power inputs, to protect the circuitry in case of short circuits or other fault conditions on the channel outputs.**

Fuses must be sized correctly for the appropriate power consumption. The fuses should normally be installed close to the power supply, to not only protect the LightSwarm units, but also the power supply and distribution cabling.

Four in-line blade fuse holders are provided with each module. A selection of blade fuses is also provided.

<b>Terminal Number</b>	<b>Connector 1</b>	<b>Connector 2</b>	<b>Connector 3</b>	<b>Connector 4</b>	<b>Polarity</b>
1	Channel 0	Channel 16	Channel 32	Channel 48	-
2	Channel 0	Channel 16	Channel 32	Channel 48	+
3	Channel 1	Channel 17	Channel 33	Channel 49	-
4	Channel 1	Channel 17	Channel 33	Channel 49	+
5	Channel 2	Channel 18	Channel 34	Channel 50	-
6	Channel 2	Channel 18	Channel 34	Channel 50	+
7	Channel 3	Channel 19	Channel 35	Channel 51	-
8	Channel 3	Channel 19	Channel 35	Channel 51	+
9	Channel 4	Channel 20	Channel 36	Channel 52	-
10	Channel 4	Channel 20	Channel 36	Channel 52	+
11	Channel 5	Channel 21	Channel 37	Channel 53	-
12	Channel 5	Channel 21	Channel 37	Channel 53	+
13	Channel 6	Channel 22	Channel 38	Channel 54	-
14	Channel 6	Channel 22	Channel 38	Channel 54	+
15	Channel 7	Channel 23	Channel 39	Channel 55	-
16	Channel 7	Channel 23	Channel 39	Channel 55	+
17	Channel 8	Channel 24	Channel 40	Channel 56	-
18	Channel 8	Channel 24	Channel 40	Channel 56	+
19	Channel 9	Channel 25	Channel 41	Channel 57	-
20	Channel 9	Channel 25	Channel 41	Channel 57	+
21	Channel 10	Channel 26	Channel 42	Channel 58	-
22	Channel 10	Channel 26	Channel 42	Channel 58	+
23	Channel 11	Channel 27	Channel 43	Channel 59	-
24	Channel 11	Channel 27	Channel 43	Channel 59	+
25	Channel 12	Channel 28	Channel 44	Channel 60	-
26	Channel 12	Channel 28	Channel 44	Channel 60	+
27	Channel 13	Channel 29	Channel 45	Channel 61	-
28	Channel 13	Channel 29	Channel 45	Channel 61	+
29	Channel 14	Channel 30	Channel 46	Channel 62	-
30	Channel 14	Channel 30	Channel 46	Channel 62	+
31	Channel 15	Channel 31	Channel 47	Channel 63	-
32	Channel 15	Channel 31	Channel 47	Channel 63	+
33	Not Used	Not Used	Not Used	Not Used	
34	Not Used	Not Used	Not Used	Not Used	

**LS-D64P400 and LS-D32P400 Cable Assignments**