Model 4242-1
DMX512 Controlled Four-Channel DC Dimmer

Instruction Manual

Revision 1
July 22, 2005

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Description

The Model 4242-1 is a small 4-channel DC dimmer intended for built-in or permanent installations. It may be used in portable applications if an appropriate enclosure and connectors are provided. It works great on 12V, 24V, and 36V systems using halogen lamps but may also be used for LEDs. Items requiring DC switching (such as small motors and relays) under DMX512 control should use the "non-dim" mode.

You may also use the dimmer in a stand-alone application by setting the dimming levels once (using the Default Levels), then disconnecting the DMX512 controller. Now, every time the power is turned on, the lights will go to the levels you set.

The dimmer is normally supplied as a PC board that must be installed in an enclosure. It may also be custom ordered mounted to a wall plate of your choosing and/or pre-installed in an enclosure with or without power supplies. It may also be custom ordered to play a set sequence for applications like fountain lighting. If you would like a customized version, please contact us for pricing and options.

Dimmers either control the high ("+") side of the power or the low (ground or "-") side. This dimmer controls the ground side. This means one side of all lamps is directly connected to the "+" output of the power supply and the other side of each lamp is connected to a dimmer channel. A heavy ground wire (or two) goes from the dimmer back to the power supply "-" output.

Dimming is accomplished using Pulse Width Modulation (PWM) where power to the lamp is rapidly turned on and off. With incandescent lights, the filament never goes out, it just gets dimmer. LEDs, however, actually blink at the PWM rate. This can sometimes cause undesirable visual effects such as flickering, especially if the LED or the viewer is moving or the viewer is looking directly at the LEDs.

The dimming of LEDs (Light Emitting Diodes) has been patented by another company. Use of this or any other dimmer for LEDs may infringe upon one or more patents. It is up to the installer to verify that they are authorized to dim LEDs.

We will gladly assist you in setting up your application. There may also be newer documentation and/or application notes on our web page.

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Specifications

Lamp outputs (four independent):

- 10Arms[1] each output, 20Arms max for the board, up to 40VDC
- Designed to drive the high peak current of halogen lamps.
- Ground-side switching (N-channel MOSFET, 0.02 ohm).
- Short[2], over-voltage, reverse-voltage protected.
- On overheating, one or more outputs are turned OFF until the board cools.
- The board may be operated in dim or non-dim (relay) mode.
- PWM pulses are sequenced to reduce power surges in the lamp power supply.
- PWM switching time is controlled to reduce electrical noise (EMI).

Processor power: 9-30VDC, 50mA typical

- This may be the same power supply as the outputs, or a separate supply.
- Ground is shared between the processor supply, lamp supply, and the DMX512 cable.

Control Input:

- DMX512-1990, DMX512A, non-isolated (RDM in a future firmware release)
- 1 second timeout (Outputs go to default levels on timeout)

Channel selection: DIP switch, blocks of 4 addresses on boundaries of 4

- Example: channels 1-4, channels 5-7, channels 509-512, etc.

Default Levels: A level may be set for each channel for use on loss of the DMX signal.

- The factory default is for all 4 channels to turn OFF on loss of DMX signal.
- Each channel's default level may be different (ex: 1=100%, 2=50%, 3 & 4=0%).
- The default levels will be used on power up until a valid DMX512 signal is detected.
- Great for stand-alone applications where the dimming levels rarely change (a DMX512 controller is only needed to set up or change the levels).

Indicator Lights: 4 for output status, 1for Power/Fault status.

Environmental: 0-40C for normal operation and longest life, 85C at the processor is the automatic shutdown temperature. Non-condensing hummidity.

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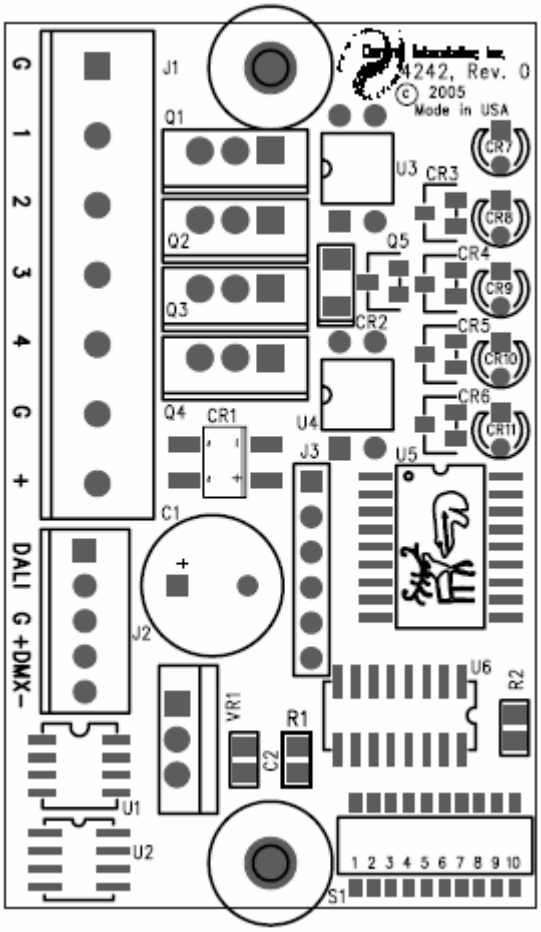
1 "Arms" (Amps, RMS (Root Mean Square)) is a current measurement that gives the heating effect as if it were simple DC current. Example: a 10A resistive load dimmed to 50% would equal 5Arms (1/2). Incandescent lamps change resistance at different dimming levels, so this complicates the calculation. It's normally safe to use the current calculated from the lamp specifications (a 75W, 12V halogen lamp draws 6.25A). The maximum current the board can supply is 20Arms with any combination of channels.

2 The output drivers will deliver up to 50A for a short period of time before turning off. They will turn back on from time to time without warning to see if the short has been fixed. The power supply should be fused to prevent damage to it, the dimmers, and/or the wiring.

Mounting & Connecting

ALWAYS follow all applicable national and local codes when installing and using this device. Use common sense and plan ahead. Never run low voltage wires with AC Mains (power) wires.



Assuming you have the standard version of the board, you will need to install it in some sort of enclosure. If you ordered a version pre-installed in an enclosure or customized in any way, please refer to any special instructions that may have been included.

Handle the board carefully as you would any electronic device. The board is relatively rugged, but can be damaged by physical abuse and high static-electricity environments. If in doubt, connect a temporary ground wire to one of the "G" terminals leaving a bit of bare wire exposed. The other end should be connected to either the metal enclosure you're working on or a grounded appliance (soldering iron, computer, conduit, etc.). You should then touch the ground wire before touching the board. If you have a grounding strap, then connect this to the ground wire.

Looking at the board you have you'll notice that not all the parts are installed and J2 only has 3 connections instead of 5. This is normal for this model; the same board is also used for other models.

To mount the board, use #4 (3mm) screws (not included) through the two mounting holes (the large holes at the top and bottom) and the included short spacers. There is also a rubber spacer under J1 to prevent the board from bending when you tighten the screws on J1. Other mounting methods may occur to you, use what works and is safe. Never screw the board directly to a flat surface without spacers, the components and protrusions on the back of the board will cause it to warp, breaking connections on the board. It will also short out if the surface is metal. Make sure no bare wires or other metal will touch or fall on any part of the board when the power is on.

In any installation, cooling should be considered; the dimmer module will dissipate up to 4W if used at max capacity. If you use only low-current lamps or LEDs, the dimmer may

not even get warm. Allowing some air flow is normally all that's required (avoid air-tight plastic enclosures), but in a hot environment a small DC fan may be advisable. The four MOSFET devices (Q1-4) may get VERY hot (150C) in fault conditions, do not let wires touch these devices as the insulation may melt. Also, keep your fingers away to prevent burns when the unit is operating.

If installed outdoors or in damp locations, protect the board from moisture. A NEMA compliant water/oil-resistant enclosure is often the best choice.

You may place any number of these boards in the same enclosure; just remember to supply enough power and cooling for all of them.

Verify that your lamp power supply is the proper voltage for the lamps you are using and does not supply more than 40VDC (AC will not work with this dimmer). Also, it should be able to supply enough current operate all 4 lamps at the same time. Do not connect the AC Mains power until all the other connections have been made, except connecting Earth ground first is recommended.

The dimmer outputs are not fused, but will current-limit at about 50A in the case of a short until they overheat and shut off. Your lamp power supply should either have a fused output or preferably automatically shut down the output in the case of excessive current draw (often called "fold back current limiting").

Connect one side of each lamp to the "+"output of the lamp power supply (possibly through a fuse). Connect the other side of each lamp to one of the four larger screw terminals (J1) marked "1"-"4". If you don't need all four channels, simply leave the unused ones unconnected, there is no need to disable them.

Using heavy-gauge wire, connect BOTH ground ("G") terminals on J1 to the "-" output of the lamp power supply.

If the output of the lamp power supply is less than 30VDC, you may use it to also supply the processor power to the dimmer board. Run a wire (anything over 20 gauge is ok) from the "+" output of the lamp supply to the "+" terminal on J1. The lamp supply will now power the lamps and the processor on the board.

If you wish to use a separate supply for the processor power, you may use any small DC power supply or AC adaptor that can supply 100mA or more between 9VDC and 30VDC (9VDC @ 300mA would be a good choice). Note that inexpensive adaptors often supply considerably more voltage than they are marked as supplying. If the output polarity is not marked, plug in the power supply and verify with a meter which lead is "+" and which is "-". Unplug the supply and connect the "-" lead to either of the "G" terminals on J1, sharing the terminal with one of the lamp ground wires (it may be easier to connect directly to the "-" output of the lamp power supply). Connect the "+" lead to the "+" terminal on J1. Note that in this case the "+" terminal of J1 is **NOT** connected to the lamp power supply. When using two power supplies, it does not matter which one is

turned on or off first.

Now we will connect the DMX512 wires to the smaller terminals (J2). The DMX512 Shield or Ground connection goes to the terminal marked “G”, Data+ goes to the terminal marked “+” and Data- goes to the terminal marked “-“. If this is not the last device on this DMX512 cable, then you would need to connect the wires going to the next device to these same terminals (parallel connection). Do NOT connect DMX512 cables in a “star” configuration. If in doubt, either contact us or refer to other reference material as to how to run and connect DMX512 cables. When using CAT5 cable, only two pair are normally used, tape or cut off the spare wires to prevent shorts.

If you are using this in a stand-alone application (hallway, museum, etc.) where you don’t want the dimming levels to change once set, you only need to hook up the DMX512 cable long enough to set the default levels. This could even be done in your office with only the processor power and DMX512 wires connected. If you have a stand-alone application where the levels need to change over time in a loop, contact us for custom programming.

Application hint:

1. Hook two 75W, 12V halogen lamps in series and use a 24V lamp power supply to give you 150W of light per channel.
2. Hook three 75W, 12V halogen lamps in series and use a 36V lamp power supply to give you 225W of light per channel. In this case, you’d have to use a separate processor power supply since 36V is too high for the processor.

The above works because lamps in series will still draw the same current as one lamp (as long as you increase the voltage of the lamp power supply).

Setting the DIP Switches

Most DMX512 products use DIP switches to set the starting address, termination, and possibly other options. This device is only different in that the DIP switch used is ½ the normal size in order to fit on the small board and only 7 switches are used for the starting address. You'll find the DIP switch ("S1") in the lower right corner of the board. There are 10 individual switches numbered from "1" on the left to "10" on the right. Slide the tiny white button towards the bottom of the board to set a switch to OFF, slide it towards the top of the board to turn it ON. Do not use a pencil to slide the button since pieces may break off and jam the switch. Instead, use a small screwdriver, paper clip, or other such item to slide it. A magnifying glass may be helpful in telling what position it is in, it doesn't move far.

The starting address and dim/non-dim mode switches are ONLY read at power up and when the SET switch is turned on. Changes to switches 1-8 will be ignored until the processor power is turned off or the SET switch is turned on.

Starting Address

The first 7 switches are used to select the DMX512 starting address for the dimmer channels. If the starting address is 5, this means the first dimmer channel is 5, the second is 6, the third is 7, and the fourth is 8. See the table below for all possible address settings. There is no harm in more than one device having the same address selected, they will simply dim to the same levels.

Dim/Non-Dim Mode

The next switch, #8, is used to select between dim and non-dim modes. Setting this switch to ON selects non-dim mode for all four channels, you can not have some channels in dim mode and others in non-dim on the same board. In dim mode the outputs are turned on and off rapidly in order to dim a lamp. If you are operating a relay, small motor, or other device, this pulsing could damage something or at least cause undesired operation. In non-dim mode, a DMX512 level below 50% will cause the output to be off, any level above 50% will turn the channel full on with no pulsing.

Default Dimming Levels

Switch #9 (SET) is used to set the default dimming levels. These are the levels the outputs are set to on power up, loss of the DMX512 signal, and when used in stand-alone mode. When this switch is turned on, the present level of all four channels is memorized (if the DMX512 signal is missing, nothing will happen until the signal returns). After a few seconds, all the outputs and the Power/Fault Indicator will blink off to indicate that the levels have been memorized. You should now turn this switch off. If you leave it on, the levels will be re-memorized and the lights will blink every few seconds. The default levels will be remembered until you change them, even if the power is off for years.

If you can't or don't wish to operate the SET switch with the power on, you may also use the following method to set the default levels:

1) Turn off the dimmer power;
2) Set switch #9 to ON;
3) Tell the DMX512 controller to send the levels you wish to memorize;
4) Turn on the dimmer power;
5) Verify that the lights are at the desired level (they will be blinking off every few seconds);
6) Tell the DMX512 controller to stop sending ("P0" for our Model 4201);
7) Turn off the dimmer power;
8) Set switch #9 to OFF;
9) Turn on the dimmer power;
10) Verify that the lights are at the desired default levels (the Power/Fault light will blink slowly indicating the loss of DMX512 data);
11) Tell the DMX512 controller to start sending;
12) Verify that you can now control the lights normally (the Power/Fault light will stop blinking).

DMX Termination

Switch #10 enables the DMX512 termination. The last physical device on a DMX512 cable MUST have its termination enabled; all other devices MUST have it disabled. Turning switch #10 on enables termination.

DIP Switch Table

This table is in the format (Starting Address)-(DIP Switch Settings). A switch setting of zero means the switch is off, 1 means it is on. The switches are set from left to right, so to set a starting address of 137, you would set switch 1 off, 2 on, 3-5 off, 6 on, and 7 off. Switches 8-10 are used for other options and do not effect the Starting Address.

Address-Switches	Address-Switches	Address-Switches	Address-Switches
1-0000000	129-0000010	257-0000001	385-0000011
5-1000000	133-1000010	261-1000001	389-1000011
9-0100000	137-0100010	265-0100001	393-0100011
13-1100000	141-1100010	269-1100001	397-1100011
17-0010000	145-0010010	273-0010001	401-0010011
21-1010000	149-1010010	277-1010001	405-1010011
25-0110000	153-0110010	281-0110001	409-0110011
29-1110000	157-1110010	285-1110001	413-1110011
33-0001000	161-0001010	289-0001001	417-0001011
37-1001000	165-1001010	293-1001001	421-1001011
41-0101000	169-0101010	297-0101001	425-0101011
45-1101000	173-1101010	301-1101001	429-1101011
49-0011000	177-0011010	305-0011001	433-0011011
53-1011000	181-1011010	309-1011001	437-1011011
57-0111000	185-0111010	313-0111001	441-0111011
61-1111000	189-1111010	317-1111001	445-1111011
65-0000100	193-0000110	321-0000101	449-0000111
69-1000100	197-1000110	325-1000101	453-1000111
73-0100100	201-0100110	329-0100101	457-0100111
77-1100100	205-1100110	333-1100101	461-1100111
81-0010100	209-0010110	337-0010101	465-0010111
85-1010100	213-1010110	341-1010101	469-1010111
89-0110100	217-0110110	345-0110101	473-0110111
93-1110100	221-1110110	349-1110101	477-1110111
97-0001100	225-0001110	353-0001101	481-0001111
101-1001100	229-1001110	357-1001101	485-1001111
105-0101100	233-0101110	361-0101101	489-0101111
109-1101100	237-1101110	365-1101101	493-1101111
113-0011100	241-0011110	369-0011101	497-0011111
117-1011100	245-1011110	373-1011101	501-1011111
121-0111100	249-0111110	377-0111101	505-0111111
125-1111100	253-1111110	381-1111101	509-1111111

Status Indicators

There are 5 Status Indicator Lights on the board. The top one is GREEN and is used to indicate the current board Power/Fault Status.

Steady on: Board is healthy and a valid DMX512 signal is being received.
Slow Blinking: Board is healthy, DMX512 signal timeout.
Fast Blinking: Fault (over-temperature or shorted output).
Blinks off every few seconds: SET switch (#9) is turned on.
Off: Processor power failure, bad board, or just powered up.

The remaining four Status Indicator Lights are yellow and show the current status of the outputs. They will dim along with the outputs.

If an output is shorted to ground, the Indicator Light for that channel will be on full.
If a channel overheats, then the Indicator Light for that channel will be off.
If the board overheats, all four channels will be off.
If the lamp power supply is off, then the Indicator Light s may be on regardless of the dimmer setting (as long as the processor power is on).

California Proposition 65 Warning

The following information is required by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). This California regulation does not address safe levels; therefore, even trace amounts of the chemicals included on Proposition 65's list of chemicals known to the State of California to cause cancer or reproductive toxicity must be noted.

WARNING: This product contains lead and/or other chemicals known to the State of California to cause cancer and/or birth defects and/or other reproductive harm.

FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions:

1. This Device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warranty

Durand Interstellar, Inc. warrants this product to be free from manufacturing defects in original material, including original parts, and workmanship under normal use and conditions ("manufacturing defect") for a period of one (1) year from date of original purchase. A charge will be made for repairs not covered by the warranty.

Should service become necessary, contact Durand Interstellar, Inc. for return authorization and then:

- Pack the unit in a well-padded corrugated box
- Enclose a copy of your proof of purchase, if you are not the original purchaser
- Ship the unit prepaid via an insured carrier

NOTE: This warranty is void if the product is:

- Damaged through negligence, misuse, abuse, or accident
- Modified or repaired by anyone other than Durand Interstellar, Inc.
- Damaged because it is improperly connected to other equipment
- Damaged by any power source that does not meet stated specifications

NOTE: This warranty does not cover:

- Damage to equipment connected to the product
- Cost incurred in the shipping of the product to Durand Interstellar, Inc.
- Damage or improper operation of unit caused by customer abuse, misuse, negligence, or failure to follow operating instructions provided with the product
- Ordinary adjustments to the product which can be performed by the customer as outlined in the instruction manual
- Improper operation of the unit caused by software written by any third party

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