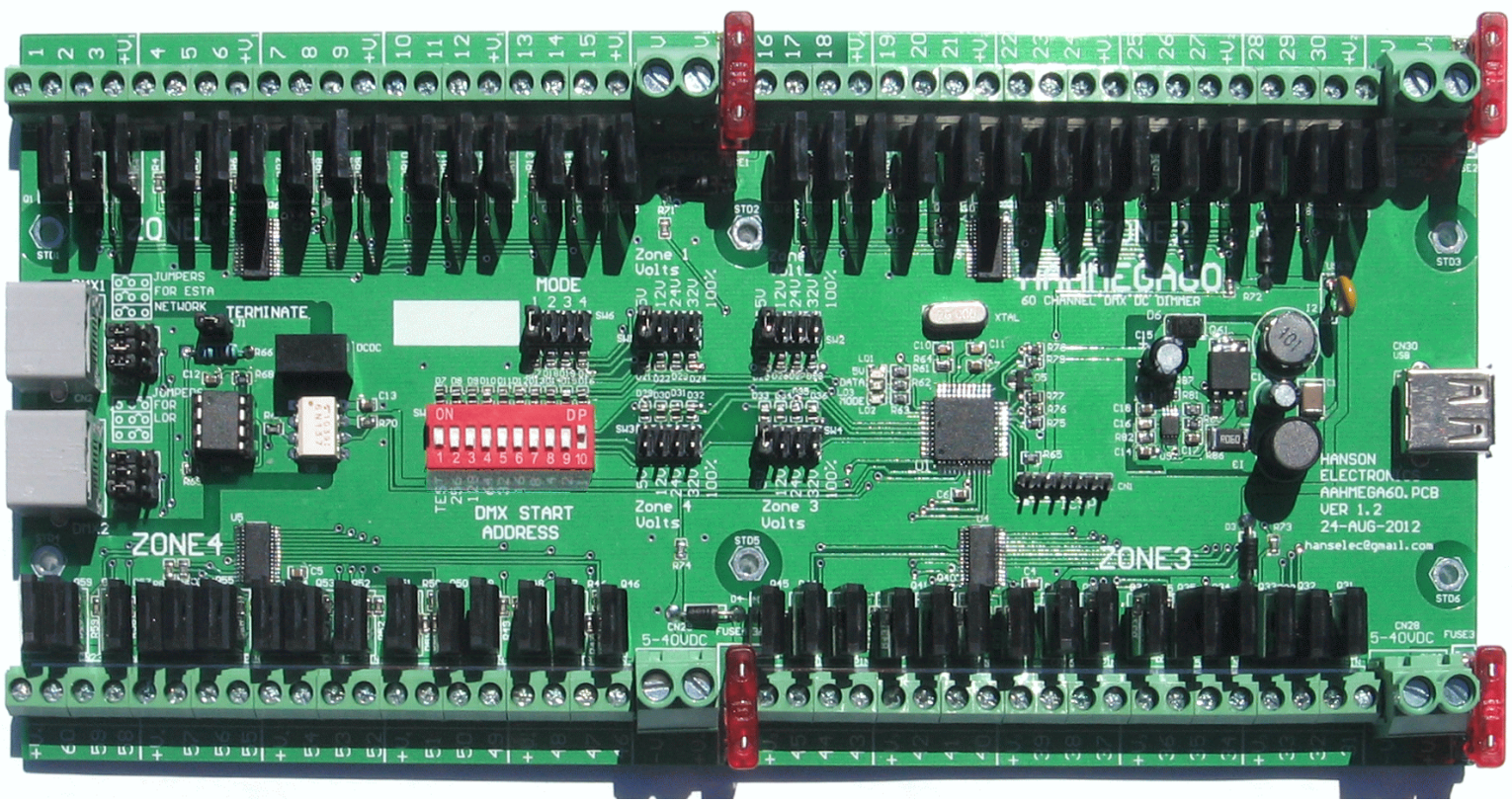
AAHMEGA60 USER MANUAL



Features

-The AHMEGA60 controller accepts DMX data input and drives 60 DC channels.
-Quad DC input (5V - 40V) (large screw terminals)
-4x 30A mini blade fuses (30A overall max per 15 channels)
-Adjustable output voltage per zone. Pulse width modulated output voltage emulation
-60 DC outputs (5A max per channel). Common positive (common anode) configuration.
-Output terminals arranged as V+, Ch, Ch, Ch (particularly suits RGB)
-True electrically isolated DMX input (2x RJ45 sockets for looping)
-ESTA or LOR network wiring configuration can be selected via on board jumpers adjacent to RJ45 DMX sockets
-Remaining zones will continue working if any fuse blows
PCB size is 238mm x 115mm

Revision 4
Suits Firmware 2.1
Suits PCB revision 1.2
30 September, 2015

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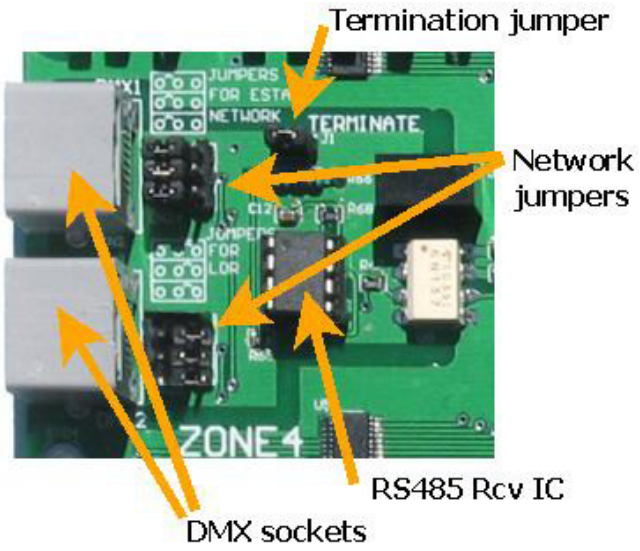
Connections

Dmx Data



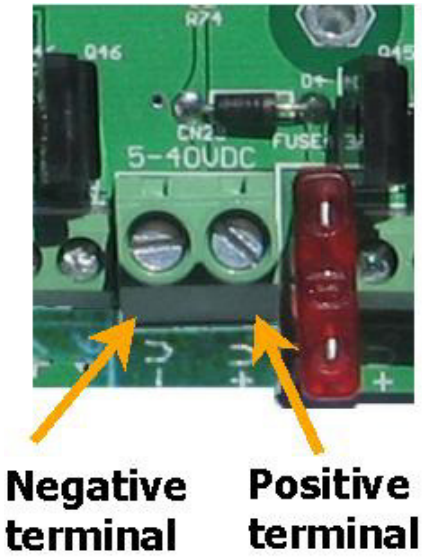
There are 2 RJ45 dmx sockets on the board. These are designed for loop in and loop out.

If the AAHMega60 is the last dmx device on the dmx cable then the signal should be terminated with the termination jumper. Basically if only 1 cable is plugged in to the dmx sockets then the termination jumper should be installed. If both sockets are used then the termination jumper should be left off.

There are 2 sets of jumpers adjacent to the dmx sockets. These allow for connection to either ESTA or Light-O-Rama (LOR) networks. If the next device connected to a given socket is wired according to the ESTA standard then the 3 jumpers would be installed in the ESTA network position. If the next device is a LOR device (USB dongle, CTB16PC etc) then the 3 jumpers would be installed in the LOR position. The relative positions for the 2 networks is marked on the pcb.

It is recommended that the dmx cables not be connected when changing from LOR to ESTA as an accidental short circuit may damage the dmx transmitter.

DC Power Input



The 4 large 2 way green connectors are the DC inputs from your power supply. Each of the 4 zones of 15channels can use a separate power supply or you can feed them all from one common power supply. Separate wiring (back to the power supply) for each of the zones is recommended to minimise voltage drop. The +V terminals are positive and the -V terminals are negative. Any DC voltage in the range of 5V to 40V can be used. The negative (-V) terminals are commoned between the 4 zones so this must be taken into account when wiring up to the power supply/supplies. Each of the 4 zones has a standard ATX (automotive) fuse adjacent to the power terminals. The AAHMega60 comes supplied with 10A fuses fitted. Fuses up to 30A can be used. It is recommended changing the fuse to the closest size for the total current that the zone will be supplying. It's also recommended that bootlace ferrules be connected to the wires for the power connection. These provide a much better connection than bare wires and don't have the risk of the solder melting like tinned wires can do.

Dimmer Outputs

There are 60 channel outputs; 30 per side with each side divided into 2 zones. Each side can be run at the same, or a different supply voltage. Any DC voltage in the range of 5V to 40V can be used for each of the banks.

The maximum load per channel is 5 Amps, but remember that the overall limit per bank/zone of 15 outputs is 30 Amps. This means that you can't turn on all 15 outputs of a zone with the maximum load. In reality, this should not be a problem as most loads will be less than 2 Amps.

There are 60 dimmer outputs which are in banks (zones) of 15 with each zone of 15 fused separately. Each group of 3 outputs is grouped into 4 terminals. These are the 3 outputs and a common positive. RGB lights with a single common anode should have the common wire connected to the terminal +V (the 4 banks have common +ve terminals $+V_1$, $+V_2$, $+V_3$ and $+V_4$) and the red, green and blue wires to channels 1,2,3 (or 4,5,6 etc). The order and specific channels is actually dependant on what is configured in your sequencing software. For lights that have single colours (or single channels) per pair of wires then 1 wire gets connected to the +V and 1 gets connected to the channel output. For led lights which require the polarity to be around the right way then the anode (positive) gets connected to +V and the cathode (negative) goes to the channel. For lights that do not have three channels commoned then 3 wires will be joined and fitted to the +V for the 3 channels.

See the Connection Examples section for the various methods of connecting lights.

USB Connector

A USB connector is provided for program (firmware) updates. This currently has not been enabled in the firmware.

ICSP Connector

A ICSP (in circuit serial programming) connector is provided for initial programming of the microprocessor and for program (firmware) updates.

USING THE AAHMega60

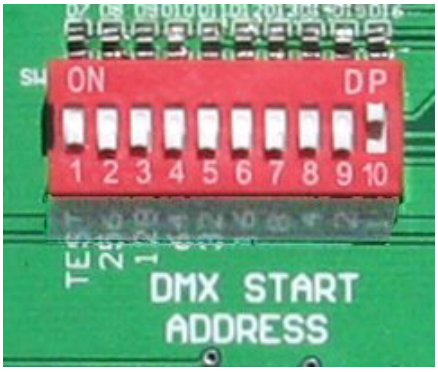
Status Leds

There are 3 small LEDs near the centre of the PCB adjacent to the micro.
Red led-Power, Blue led-Mode, Green led-Data

-Red led	5V power		
-(MODE) Blue led flashing slowly (1Hz).	(DATA)	Green led off.	Test mode
-(MODE) Blue led flashing 10Hz.	(DATA)	Green led off.	Address setting error
-(MODE) Blue led on solid.	(DATA)	Green led flashing. Normal run mode. Dmx packets being received. Flashing rate depends on Dmx data transmit rate	
-(MODE) Blue led on solid.	(DATA)	Green led off. No dmx data	

Test mode takes precedence over normal running so errors/status message other than test mode won't be displayed if in test mode.

Start Channel

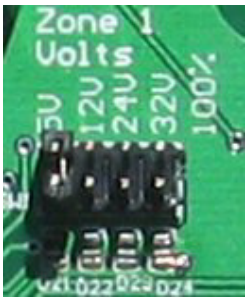


The start channel is set via 9 dipswitches. The channel is set in binary by turning on the relevant switches. DMX addresses can be anywhere between 1 and 512. The address of the AAHMega60 can be anywhere in the range of 1 to 453 (a start address of 453 uses the addresses from 453 to the maximum 512). If the address is set outside of this range an error is indicated via the 2 status leds. See **Status Leds**. The start channel can be changed at any time. The start address can be calculated by adding up the totals for the switches that are on. For example 64 + 16 + 1 would give a start address of 81. A table is provided later in the manual that lists the dmx start addresses.

Test Mode

There is a switch on the same bank of switches which places the control into a test mode. In this mode a test program runs and all 60 outputs are cycled through. This mode allows for soak testing of lights without the need for a source of dmx data. The control will cycle through 12 modes of testing from 1 led on at a time, through all reds on, all greens etc. The mode 4 jumper removes the first 4 test cycles (single led chases).

Zone Volts

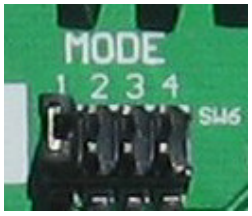


Each of the 4 zones on the pcb has a 4 way bank of jumpers that allow the apparent output voltage for that zone to be altered. With this feature a common power supply for the entire board can power up to 4 different voltages. The microprocessor measures the input voltage of the zone and adjusts the output so that it matches what is set on the jumpers. The jumper settings are 5V, 12V, 24V, 32V and when no jumper is installed the output voltage is the same as the input voltage. The peak voltage on the output is the same as the input voltage so any lights with electronics in them (like ACL strobes) MUST NOT be used on other than 100% (usually with 5V supply) as the electronics within them are not rated to high voltages.

The output voltage jumpers can be changed at any time but due to the risk to the lights of having too high an output voltage it is recommended to either set the jumpers while the unit is powered down or while the lights are turned off.

Note:- It isn't actually 5V DC (12V, 24V or 32V) but is actually a pulse width modulated output that has an average or RMS output voltage of 5V (12V, 24V or 32V). The output voltage cannot be increased and if the jumpered voltage is set to higher than the supply voltage then the control outputs the supply voltage.

Mode Jumpers



There is a jumper bank on the pcb with 4 jumpers. These jumpers are for changing the function of the test mode.
Connecting a jumper on the 4th jumper will cause the test mode to skip the single led portion of test mode.

Dmx start address table for AAHMega60. Switches are from left to right (on Dipswitch they are labelled as 2 to 10, on PCB they are marked 256, 128 ..... 1 in binary address sequence). Zeroes indicate the switch is off (down). Ones indicate the switch is on (up). First column is the start address and the second column is the 9 address switches.

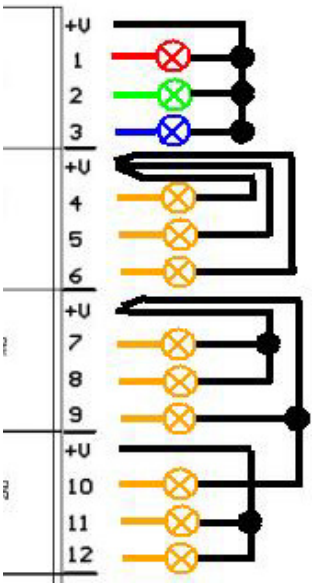
1	000000001	65	001000001	129	010000001	193	011000001	257	100000001	321	101000001	385	110000001	449	111000001
2	000000010	66	001000010	130	010000010	194	011000010	258	100000010	322	101000010	386	110000010	450	111000010
3	000000011	67	001000011	131	010000011	195	011000011	259	100000011	323	101000011	387	110000011	451	111000011
4	000000100	68	001000100	132	010000100	196	011000100	260	100000100	324	101000100	388	110000100	452	111000100
5	000000101	69	001000101	133	010000101	197	011000101	261	100000101	325	101000101	389	110000101	453	111000101
6	000000110	70	001000110	134	010000110	198	011000110	262	100000110	326	101000110	390	110000110	454	111000110
7	000000111	71	001000111	135	010000111	199	011000111	263	100000111	327	101000111	391	110000111	455	111000111
8	000001000	72	001001000	136	010001000	200	011001000	264	100001000	328	101001000	392	110001000	456	111001000
9	000001001	73	001001001	137	010001001	201	011001001	265	100001001	329	101001001	393	110001001	457	111001001
10	000001010	74	001001010	138	010001010	202	011001010	266	100001010	330	101001010	394	110001010	458	111001010
11	000001011	75	001001011	139	010001011	203	011001011	267	100001011	331	101001011	395	110001011	459	111001011
12	000001100	76	001001100	140	010001100	204	011001100	268	100001100	332	101001100	396	110001100	460	111001100
13	000001101	77	001001101	141	010001101	205	011001101	269	100001101	333	101001101	397	110001101	461	111001101
14	000001110	78	001001110	142	010001110	206	011001110	270	100001110	334	101001110	398	110001110	462	111001110
15	000001111	79	001001111	143	010001111	207	011001111	271	100001111	335	101001111	399	110001111	463	111001111
16	000010000	80	001010000	144	010010000	208	011010000	272	100010000	336	101010000	400	110010000	464	111010000
17	000010001	81	001010001	145	010010001	209	011010001	273	100010001	337	101010001	401	110010001	465	111010001
18	000010010	82	001010010	146	010010010	210	011010010	274	100010010	338	101010010	402	110010010	466	111010010
19	000010011	83	001010011	147	010010011	211	011010011	275	100010011	339	101010011	403	110010011	467	111010011
20	000010100	84	001010100	148	010010100	212	011010100	276	100010100	340	101010100	404	110010100	468	111010100
21	000010101	85	001010101	149	010010101	213	011010101	277	100010101	341	101010101	405	110010101	469	111010101
22	000010110	86	001010110	150	010010110	214	011010110	278	100010110	342	101010110	406	110010110	470	111010110
23	000010111	87	001010111	151	010010111	215	011010111	279	100010111	343	101010111	407	110010111	471	111010111
24	000011000	88	001011000	152	010011000	216	011011000	280	100011000	344	101011000	408	110011000	472	111011000
25	000011001	89	001011001	153	010011001	217	011011001	281	100011001	345	101011001	409	110011001	473	111011001
26	000011010	90	001011010	154	010011010	218	011011010	282	100011010	346	101011010	410	110011010	474	111011010
27	000011011	91	001011011	155	010011011	219	011011011	283	100011011	347	101011011	411	110011011	475	111011011
28	000011100	92	001011100	156	010011100	220	011011100	284	100011100	348	101011100	412	110011100	476	111011100
29	000011101	93	001011101	157	010011101	221	011011101	285	100011101	349	101011101	413	110011101	477	111011101
30	000011110	94	001011110	158	010011110	222	011011110	286	100011110	350	101011110	414	110011110	478	111011110
31	000011111	95	001011111	159	010011111	223	011011111	287	100011111	351	101011111	415	110011111	479	111011111
32	000100000	96	001100000	160	010100000	224	011100000	288	100100000	352	101100000	416	110100000	480	111100000
33	000100001	97	001100001	161	010100001	225	011100001	289	100100001	353	101100001	417	110100001	481	111100001
34	000100010	98	001100010	162	010100010	226	011100010	290	100100010	354	101100010	418	110100010	482	111100010
35	000100011	99	001100011	163	010100011	227	011100011	291	100100011	355	101100011	419	110100011	483	111100011
36	000100100	100	001100100	164	010100100	228	011100100	292	100100100	356	101100100	420	110100100	484	111100100
37	000100101	101	001100101	165	010100101	229	011100101	293	100100101	357	101100101	421	110100101	485	111100101
38	000100110	102	001100110	166	010100110	230	011100110	294	100100110	358	101100110	422	110100110	486	111100110
39	000100111	103	001100111	167	010100111	231	011100111	295	100100111	359	101100111	423	110100111	487	111100111
40	000101000	104	001101000	168	010101000	232	011101000	296	100101000	360	101101000	424	110101000	488	111101000
41	000101001	105	001101001	169	010101001	233	011101001	297	100101001	361	101101001	425	110101001	489	111101001
42	000101010	106	001101010	170	010101010	234	011101010	298	100101010	362	101101010	426	110101010	490	111101010
43	000101011	107	001101011	171	010101011	235	011101011	299	100101011	363	101101011	427	110101011	491	111101011
44	000101100	108	001101100	172	010101100	236	011101100	300	100101100	364	101101100	428	110101100	492	111101100
45	000101101	109	001101101	173	010101101	237	011101101	301	100101101	365	101101101	429	110101101	493	111101101
46	000101110	110	001101110	174	010101110	238	011101110	302	100101110	366	101101110	430	110101110	494	111101110
47	000101111	111	001101111	175	010101111	239	011101111	303	100101111	367	101101111	431	110101111	495	111101111
48	000110000	112	001110000	176	010110000	240	011110000	304	100110000	368	101110000	432	110110000	496	111110000
49	000110001	113	001110001	177	010110001	241	011110001	305	100110001	369	101110001	433	110110001	497	111110001
50	000110010	114	001110010	178	010110010	242	011110010	306	100110010	370	101110010	434	110110010	498	111110010
51	000110011	115	001110011	179	010110011	243	011110011	307	100110011	371	101110011	435	110110011	499	111110011
52	000110100	116	001110100	180	010110100	244	011110100	308	100110100	372	101110100	436	110110100	500	111110100
53	000110101	117	001110101	181	010110101	245	011110101	309	100110101	373	101110101	437	110110101	501	111110101
54	000110110	118	001110110	182	010110110	246	011110110	310	100110110	374	101110110	438	110110110	502	111110110
55	000110111	119	001110111	183	010110111	247	011110111	311	100110111	375	101110111	439	110110111	503	111110111
56	000111000	120	001111000	184	010111000	248	011111000	312	100111000	376	101111000	440	110111000	504	111111000
57	000111001	121	001111001	185	010111001	249	011111001	313	100111001	377	101111001	441	110111001	505	111111001
58	000111010	122	001111010	186	010111010	250	011111010	314	100111010	378	101111010	442	110111010	506	111111010
59	000111011	123	001111011	187	010111011	251	011111011	315	100111011	379	101111011	443	110111011	507	111111011
60	000111100	124	001111100	188	010111100	252	011111100	316	100111100	380	101111100	444	110111100	508	111111100
61	000111101	125	001111101	189	010111101	253	011111101	317	100111101	381	101111101	445	110111101	509	111111101
62	000111110	126	001111110	190	010111110	254	011111110	318	100111110	382	101111110	446	110111110	510	111111110
63	000111111	127	001111111	191	010111111	255	011111111	319	100111111	383	101111111	447	110111111	511	111111111
64	001000000	128	010000000	192	011000000	256	100000000	320	101000000	384	110000000	448	111000000		

Note 1:- Many DMX devices use the reverse order. The AAHMega60 uses the order as would be converted and shown on a calculator, computer etc.
Note 2:-Dipswitch 1 is used to turn on and off the test mode.

Faultfinding

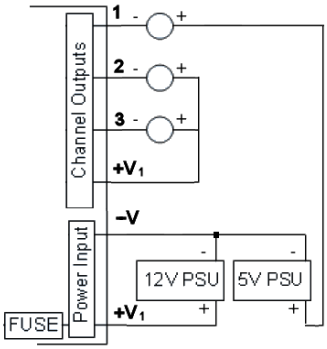
Fault	Solution/solutions
Power Led (red led) not lit	-Fuse/s blown (note the control only needs power to 1 zone for power led to be on and for that zone to work). Check fuses -Power supply faulty or not turned on. -Power supply section of pcb damaged. No user repairable parts. Return for repair
1 or more Zones not working	-Fuse for that zone is blown, power supply powering that Zone is faulty or there is a wiring fault
Channel failing to turn on	-Mosfet transistor has been damaged. Can be replaced but warranty may be voided. The mosfet must be replaced with the exact same type to ensure correct operation -PCB track has been burnt out. Should be evident if bottom of pcb is inspected
Channel turned on all the time	-Mosfet transistor has been damaged. Can be replaced but warranty may be voided. The mosfet must be replaced with the exact same type to get correct operation
No DMX signal	-Jumpers on wrong network setting -Jumpers installed in the wrong orientation -Termination jumper is installed when both DMX sockets are in use -No data is being sent. Check software, dongle, cable etc -DMX (RS485) receive IC is damaged. IC is socketed for easy replacement
Fuse blowing	-Fuse selection too low for lights that are connected -1 or more lights connected have short circuited wires

Connection Examples



Typical connection arrangements showing 3 RGB leds/lights, 3 single channel light and 3 2 channel light. The lights can be single colour, multicolour, RGB or whatever.

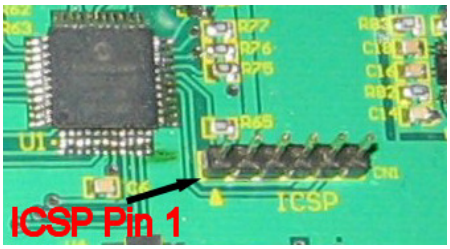
If only 5V lights were used on Zone 1 and a 12V (or any voltage higher than 5V) is used then by setting the Zone Volts on zone 1 can be set to 5V and the control will limit the output voltage to 5V. Note:- It isn't actually 5V DC but is actually a pulse width modulated ouput that have an average or RMS output voltage of 5V.



Connection example showing channel 1 connected to a second power supply. This method is used where lights other than the main power supply voltage is needed. This method can be used for ACL strobes or similar devices. The primary power supply powering the AAHMega60 needs to be in the range of 5V to 40V DC. The secondary power supply can be any voltage up to a maximum of 60V DC. This method can also be used if an output is used to control a relay at a voltage other than the supply voltage.

As it possible to run the Mega60 off up to 4 different power supplies a light on 1 zone can be powered by the supply on another zone. DO NOT use this method if outputs on a specific zone have reduced output voltages via the Zone Volts jumpers. Relays should not be connected to outputs that have reduced voltages either.

Firmware Updates



Firmware update can be loaded via the ICSP header with a Pickit3 or Pickit2 pic programmer. Pin 1 of the ICSP header is marked on the pcb and is shown to the right. Ensure the pin 1 of the header is aligned with pin 1 of the programmer.

If the firmware is being updated it is recommended to remove the fuses of any channels that are dimmed down to less than 100% with the Zone Volts jumpers as there is a possibility that during the firmware update process the leds may be turned on with 100% voltage. Under normal circumstances all leds are turned off and should remain off during the firmware update process.

Via MPLAB

MPLAB must be installed. It is available from microchip.com

Plug your PicKit 3 into a spare USB port, then start MPLAB X IDE (or version 8.84 or whatever). Once it has loaded, click Configure > Select Device to bring up the device selection window. From the device drop-down list, select PIC16F1823 and click OK.

A dialog saying "New firmware must be downloaded for PicKit 3 to work with the part selected." may pop up at this stage. If it does, click OK and wait for MPLAB to download the programming firmware to the Pickit 3. You will see some activity in the PicKit 3 tab of the output window for up to a minute or so. When MPLAB is ready you will see "PicKit 3 Connected" and possibly an error stating "PK3Err0045: You must connect to a target device to use Pickit 3". This is not a problem and just a warning that the PicKit 3 cannot "see" the chip yet.

Then, click File > Import and browse to the MEGA60 2.0 HEXFILE.hex file (latest version at time of writing) and click Open. The last line of the build tab of the output window should read "Loaded C:\...MEGA60****.HEX."

Now, connect the PicKit 3 the 6 pin ICSP header next to the micro. Make sure the arrows on the Pickit 3 and the 6 pin header are aligned. Then power up the AAHMega60. The PicKit 3 tab of the output window should now read "Target Detected".

Click Programmer > Program to initiate the ICSP operation. The PicKit 3 tab of the output window will show "Programming...", then "Programming/Verify complete" once it is done. Disconnect the PicKit 3. The PicKit 3 tab of the output window will show "Target Removed".

Via "Programmer To Go" feature of PicKit3

If a PicKit 3 has been preprogrammed with firmware then all is required is that the AAHmega60 board is powered up. Plug the PicKit3 onto the header. Power the PicKit3 by plugging it into any usb socket. The power led on PicKit will light, the status led will be green and the blue active led will be flashing. Press the pushbutton. The status led will turn red, the active led will turn solid red. When then Status led turns green again and the blue Active led starts flashing the firmware has been updated.

Via "PicKit 3Programmer" software

The Pickit 3 programmer software can be downloaded at http://ww1.microchip.com/downloads/en/DeviceDoc/PICkit%203%200.3.3.0%20Setup%20A.zip .

Extract and run in. Select PIC18F4455 as the Device. Select File>Import Hex> and browse to the MEGA60 2.1 HEXFILE.hex file (latest version at time of writing) . Plug in the PicKit 3. If the AAHmega60 is powered then click on write and it will update the firmware. If the board isn't powered then click on the "On" button in the "Target Power" section. The power and mode light on AAHmega60 should then power up. Click on "Write".

Warranty

This dmx light controller is covered by a warranty for a period of 12 months from the time of purchase.

The warranty covers only faulty material and workmanship if properly setup and operated in accordance with the specifications and setup sections of this document.

The repair and or replacement of this controller will only be at the workshop of Alan Hanson. The cost of freight to/from will be borne by the user.

The warranty does not cover damage to the controller due to misuse i.e.. shorting of outputs, connecting AC supply, connecting a supply higher than the rated voltage

The controller is supplied as is. Alan Hanson and Hanson Electronics reserves the right to make changes to the firmware, specifications and the design without notification.

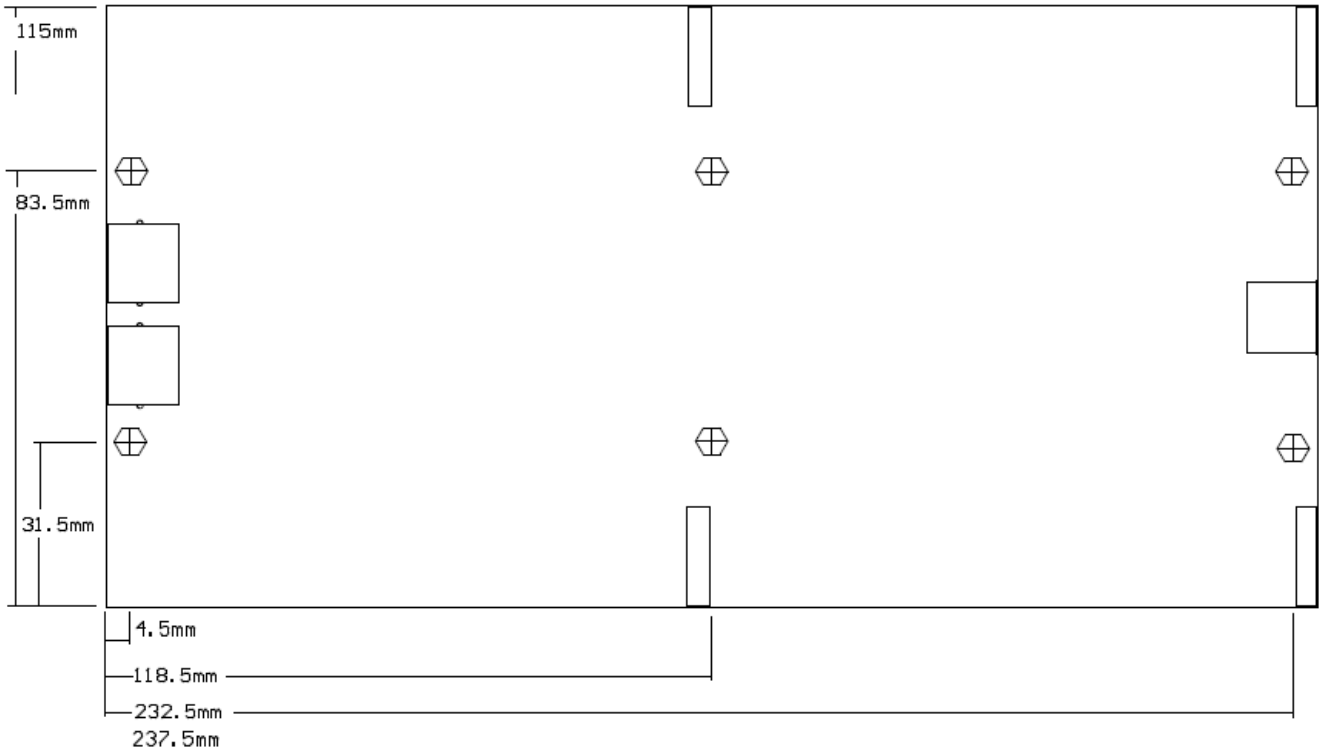
Misuse, using this for other than its designed use, water damage, mechanical damage or attempting to modify or repair your controller will void this warranty.

Alan Hanson and Hanson Electronics shall not be liable for any incidental damage, inconvenience, rental, loss of profits or any other loss due to the unsuitability, failure or use of this controller.

If the user does not agree to these terms the cost of the product (minus freight) will be refunded on the return of the product. The controller must be in unused condition and must be returned within 14 days.

Please return this controller with a copy of your invoice if it develops a fault. Any controller returned without a copy of the invoice will be charged at a standard repair rate. The warranty does not cover freight.

Mounting standoff drilling pattern.
(Scaled. Not 1:1)



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