Blue Point Engineering

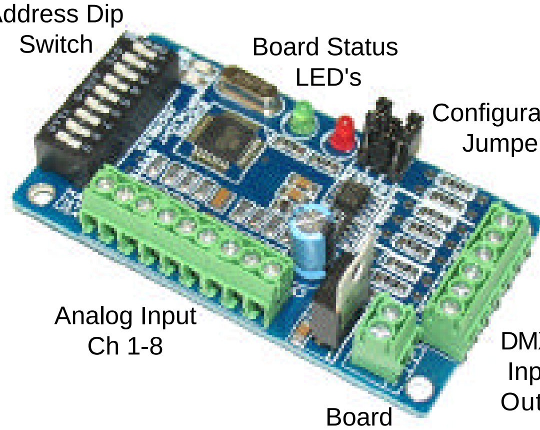
Instruction I

Pointing the Way to Solutions!

DMX 8-CH Encoder with DMX Merge

8 Channel DMX512 Encoder with DMX Merge

The DMX 8-CH Encode board accepts analog 0 - 10 VDC input and a DMX512 data stream from another DMX source. The analog voltage is combined with the DMX512 input to create a single DMX512 8-Ch output levels (0-255).



Basically the board is plug and play. There are no complex user adjustments. When all connections are properly made, a DMX signal, proportional to the input voltage will be present at the output pins.

The analog voltage (0-10 Vdc) is converted to 255 discrete DMX levels (0-255).
The controller can be used to upgrade older 0-10 volt analog light ing consoles, or add your own switches and potentiometers to create custom controls for lighting, home or building automation and animatronics applications.

Specifications:

Analog Input: 0 -10 VDC @ 5mA.This board expects a conditioned input voltage signal. Note: If the encoder board is to be used in a noisy environment, external signal conditioners should be used on the input voltage signals.

DMX512 Input: Accepts DMX512 digital stage lighting protocol up to 512 channels. Only DMX packets with a zero star code will be accepted. Non-zero star code packets will be ignored.
If non-zero start codes and DMX512 utilizing talkback capability is needed for other DMX receivers down stream from the Encoder, then a separate DMX through connector should be used for those devices.

DMX Out: Controlled slew rate drivers, decreasing the EMI radiated from the RS485 lines, and improving signal fidelity.

Address Switch: Address selection is via a 9 position mini on-board DIP switch.
Set the starting address to the first in a group of 8 channels. (See Dip Switch Setting Values)

Board Power requirements:
8 to 15 volts DC @100 mA. (Regulated power supply recommended)

Board Connections: Power and DMX output connections to the board are made via screw terminal blocks. Acceptable wire size is 18– 24 AWG. (See drawing for connector locations)

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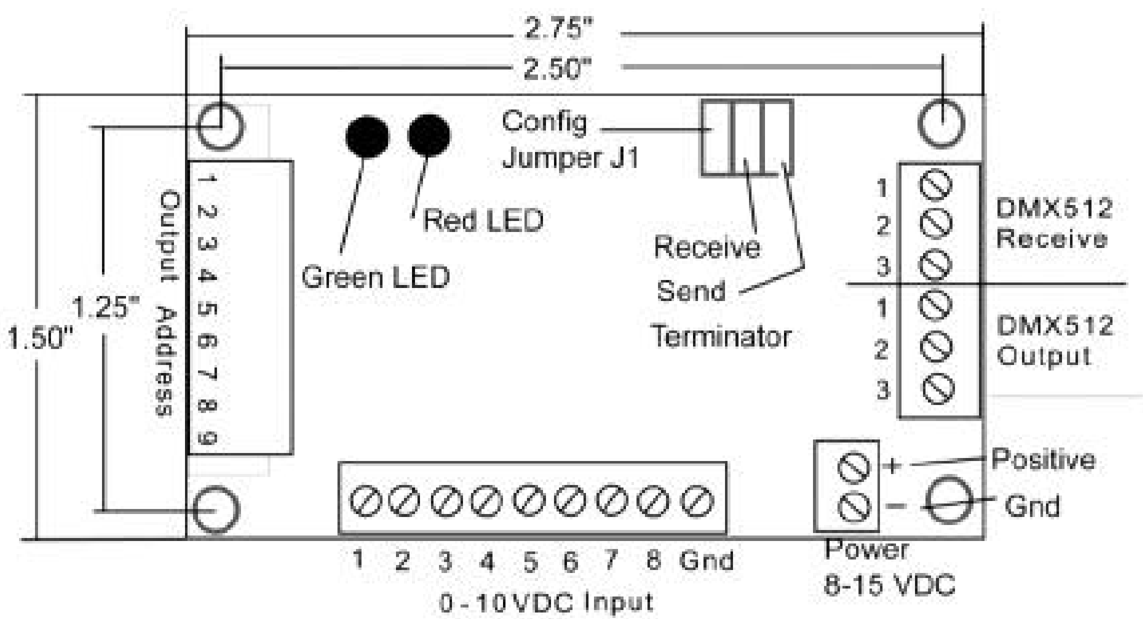
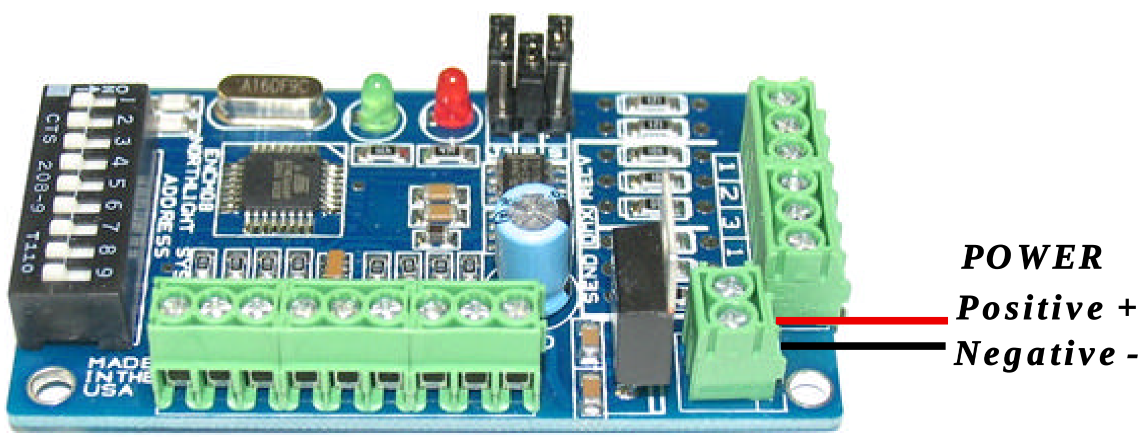
DMX output signal details:

Output is compliant with USITT 's DMX512 1990 protocol.
250 Kbaud 4us/bi
Star code:0
Break Length:150 us
Mark after Break 50 us
Inter frame time 50 us
Output channels 8 + star address or up o 512 using DMX512 input
Note that the timings are no as fast as the DMX protocol allows.The slightly longer times should accommodate old and new receivers.

Physical Dimensions:
2.75 "X 1.50 "+-.15 "





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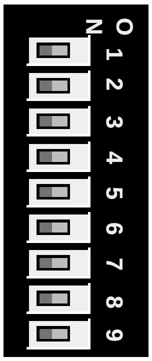


DIP Switch Numbers

1	=	1 Decimal
2	=	2 Values
3	=	4
4	=	8
5	=	16
6	=	32
7	=	64
8	=	128
9	=	256

DMX Wire

Black Wire = 2

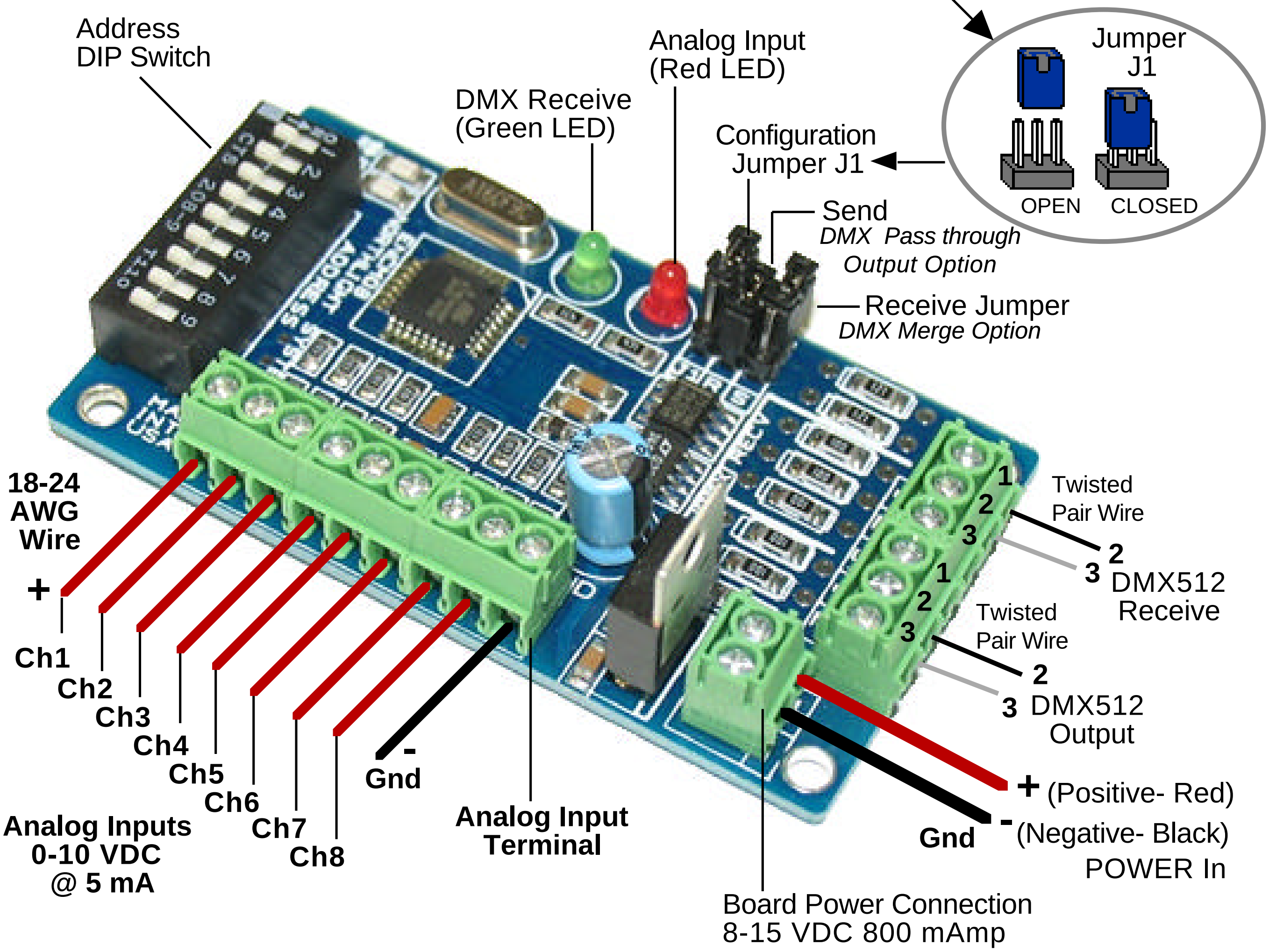
White Wire = 3

Twisted Pair Wire
22- 24 AWG

Jumper J1

Closed (jumper in place)– When the DMX receive is lost, the last valid input data will be cleared after 1 second of no valid DMX. Subsequent DMX output will be zeros.

Open (no jumper)– When the DMX receive is lost the Encoder will hold and continue to output the last valid data.



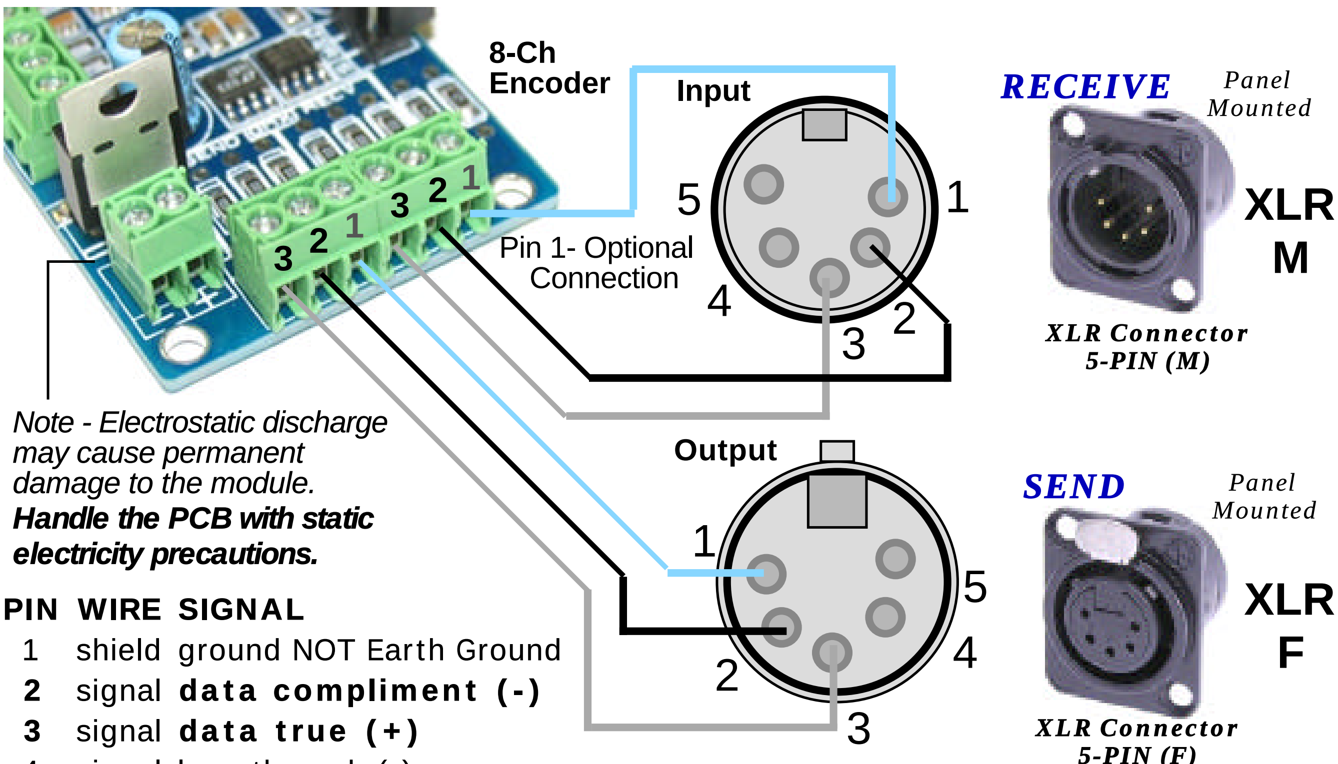
DMX 8-CH Encoder with DMX Merge

Using the 8-Ch Encoder

Power Input 8 to 15 volts DC.
Average idle current for the 8-channel encoder is 100 milliamps.
The total current is based on the DMX512 load. Generally when the DMX output is terminated the current will increase by up to 15 milliamps.
A current of 125 milliamps should cover most applications.

Analog Inputs
Input is an analog voltage spanning 0 -10 VDC @5mA.
This should be a smooth DC voltage with no noise or ripple. Any imperfections in the input voltage will be reflected in the DMX512 output.

DMX512 In
The DMX input pin numbers correspond to the XLR pin numbers.
The ground pin (1) is signal ground – not earth ground. NOTE: XLR pins 4 and 5 are no used.



Note - Electrostatic discharge may cause permanent damage to the module.
Handle the PCB with static electricity precautions.

PIN	WIRE	SIGNAL
1	shield	ground NOT Earth Ground
2	signal	**data compliment (-)**
3	signal	**data true (+)**
4	signal	loop through (-)
5	signal	loop through (+)

Mount XLR connector as desired.
Recommended wire: 24 AWG stranded & twisted together.

DMX Wire

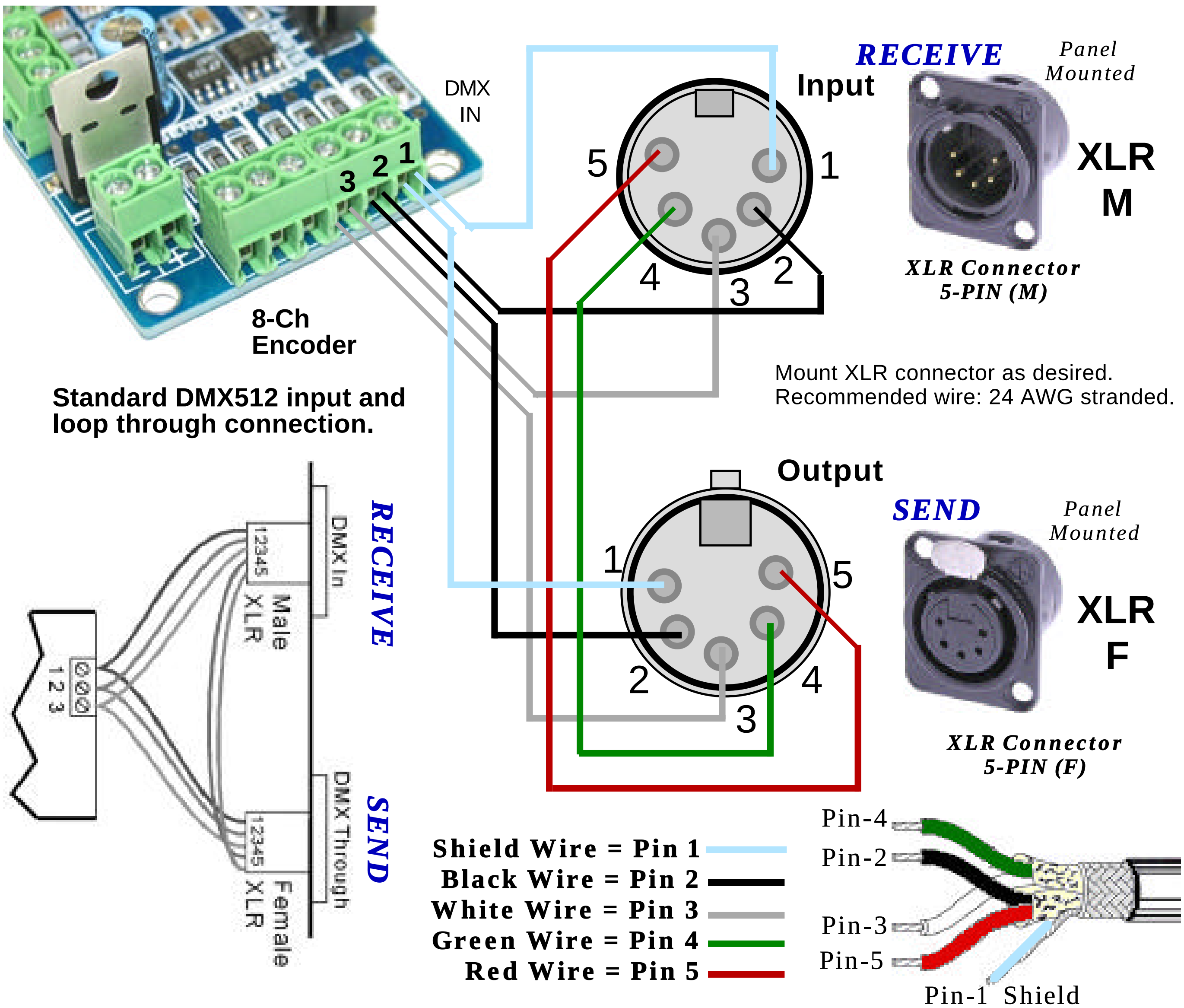
White Wire = 3
Black Wire = 2

22- 24 AWG
Twisted Pair

DMX 8-CH Encoder with DMX Merge

Setting up the DMX loop through connectors
The current DMX512 standards require one DMX to have a passive loop through connector. The specific setup is below:

Secondary data link -passive loop through ports
Devices containing two DMX512 ports, one for receive and one for transmitting , shall provide a direct passive link for all pins between the two ports. Equipment designers are encouraged to provide passive loop through on Pins 4 and 5 whenever possible, even if no required. The Encoder will not accept DMX512 with non-zero start codes and will not accept DMX512 that uses pins 4 and 5.
If devices that use non-zero start codes or pins 4 and 5 are needed then a loop through connector is required. The drawing below shows a typical installation for a DMX512 input and loop through connection.



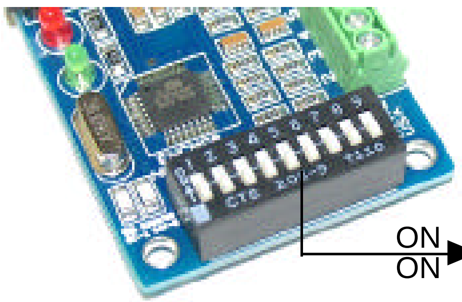
DMX 8-CH Encoder with DMX Merge

Address Switch
The address switch is used to determine the starting channel of the analog input in the DMX512 output data stream. Example, if the star address is 1 then the analog input data will be on DMX channels 1 - 8. A star address of 8 will output analog data on channels 8 – 15 in the DMX data stream.

The address switch has no effect on the incoming DMX512 data. The incoming DMX512 will be output in its original form except where the signal overlaps the analog input voltage. When the incoming DMX and analog inputs overlap the final output will be on a highest takes precedence basis.

To avoid overlapping the incoming DMX and the analog inputs one would usually address the analog voltage to be output after the incoming DMX.

When using the mini DIP switch, the address is entered in the standard binary code starting with 0. See the DMX512 Switch chart of all 512-switch positions. The individual switches are numbered 1–9, left to right, on the on-board DIP switch.



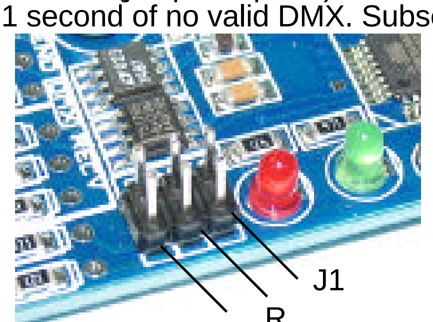
ON
ON

DIP Switch Numbers	DMX Decimal Value
1 =	1
2 =	2
3 =	4
4 =	8
5 =	16
6 =	32
7 =	64
8 =	128
9 =	256

Setting the base address:

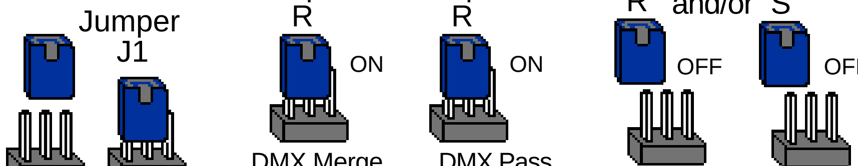
Add the value of the address DIP switches set to the **ON** position to calculate the base address. Example: DIP switches 5 and 6 set to **ON** position, the base address is now 48, (16+32) this setting is used to determine the starting address output of Channel-1, the next Channel would be address 49 for Channel-2, and the next 50 for Channel-3, 51 for Channel-4, ect

Using the Configuration Jumper
There is 1 (one) configuration jumper used to determine how the Encoder handles the output values for the DMX512 output .
J1 – Determines the DMX output in the even of DMX receive signal loss.
Open (no jumper)– When the DMX receive is lost the Encoder will hold and continue to output the last valid data.
Closed (jumper in place)– When the DMX receive is lost, the last valid input data will be cleared after 1 second of no valid DMX. Subsequent DMX output will be zeros.



J1
R
S

Jumper J1 | Jumper R | Jumper R | Jumper R and/or Jumper S



OPEN | CLOSED | DMX Merge Other Source | DMX Pass Through OUT | No DMX Merge | No DMX Output

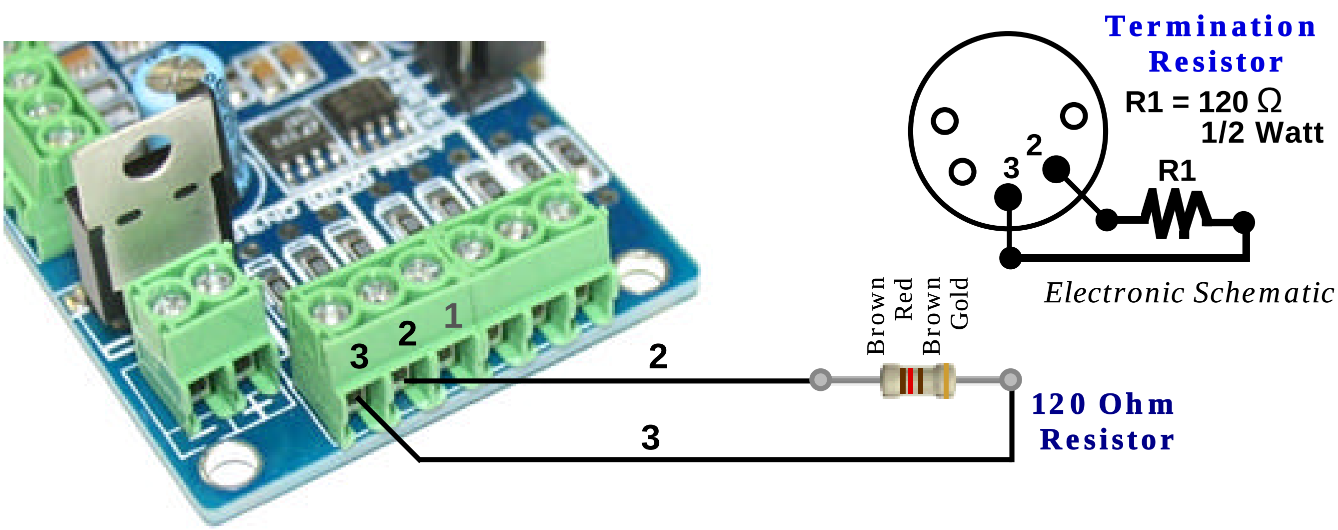
DMX 8-CH Encoder with DMX Merge

Trouble Shooting

Basically the board is plug and play. There are no user adjustments. When all connections are properly made, a DMX signal, proportional to the input voltage will be present at the output pins.

Signal Ground: The input circuit signal ground, should be connected first. On the board, there is NO connection between chassis/earth ground and Signal/common ground. Do no install one.
On the DMX data cable, there is NO connection between the shield/XLR shell earth ground and the signal/common ground. Do no connect these together.

Termination: Encoder does not contain a terminating resistor. If It is determined that a terminator is required, a 120 ohm terminating resistor can be installed on the DMX output connector, across pins 2 – 3. Terminators on the transmitter end are no usually required.
Note: Terminators on the receiver are only used if the Encoder board is the last device on the DMX data network.



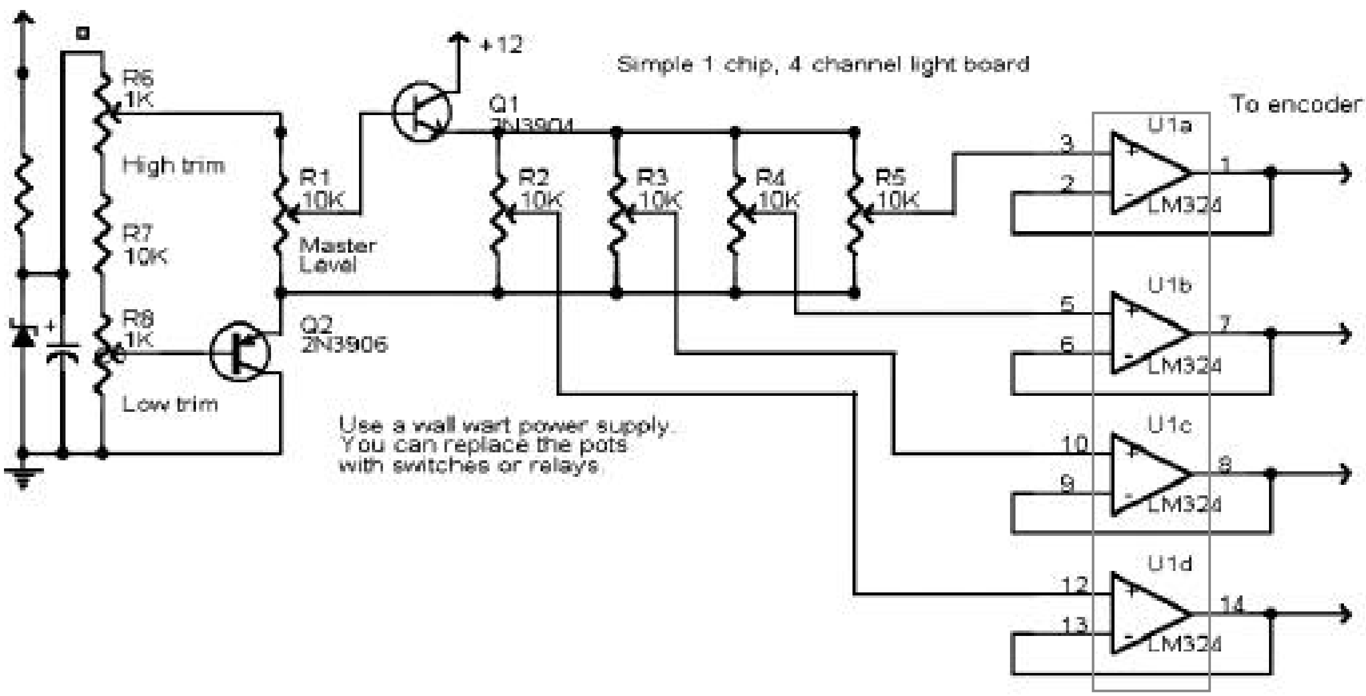
No output: Be sure the receiver address is set to a valid address. The Encoder start address should not be higher than the receiver start address. Set all the switches OFF for testing.
Check for backward DMX input and output signal connections.
If only some inputs generate DMX, check the connections and verify the input voltage at the screw terminals with a digital voltmeter.

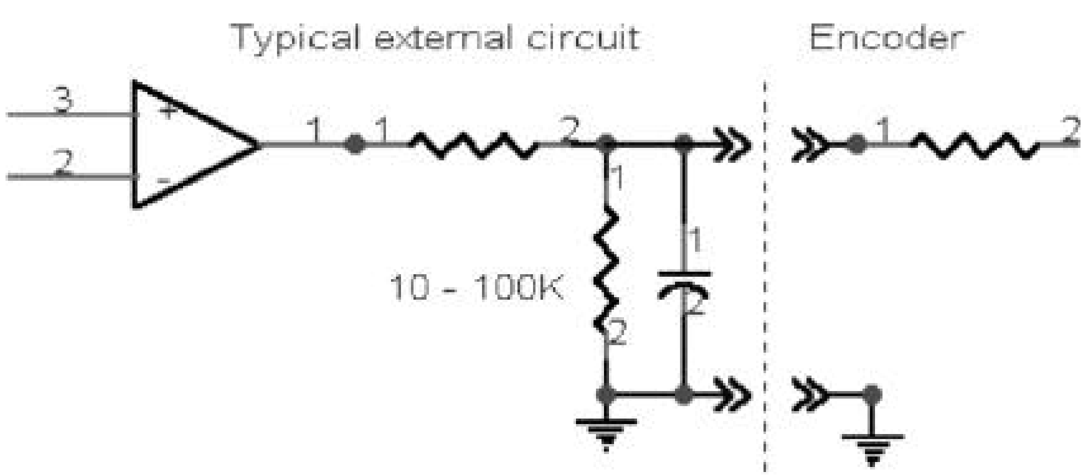
Erratic output: This problem can be hard to tack down. First check the input signal quality and voltage. If the input voltage goes over 10 VDC, the output will drop to 0 for that channel.
Another potential problem here is the user circuit interface. It is important that the ground from the external ground be connected first. The input maximum voltage is 10 VDC. Higher voltages may damage chips.

Other: Good solid connections are a must. The micro screw terminals provide good connections. However the screws can be stripped by over tightening.
DMX512 signal wires should be twisted together all the way to the connector.

DMX 8-CH Encoder with DMX Merge

Typical Input Circuit
Input is an analog voltage spanning 0 -10 VDC @5mA.
This should be a smooth DC voltage with no noise or ripple. Any imperfections in the input voltage will be reflected in the DMX512 output.





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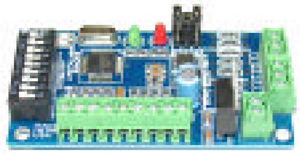
8-Channel Analog to DMX Encoder Board



DMX 512 Address Chart

Chart A - US Standard DMX 512

Ch - Switches	Ch - Switches	Ch - Switches	Ch - Switches	Ch - Switches
1 = 1	53 = 1, 3, 5, 6	105 = 1, 4, 6, 7	157 = 1, 3, 4, 5, 8	209 = 1, 5, 7, 8
2 = 2	54 = 2, 3, 5, 6	106 = 2, 4, 6, 7	158 = 2, 3, 4, 5, 8	210 = 2, 5, 7, 8
3 = 1, 2	55 = 1, 2, 3, 5, 6	107 = 1, 2, 4, 6, 7	159 = 1, 2, 3, 4, 5, 8	211 = 1, 2, 5, 7, 8
4 = 3	56 = 4, 5, 6	108 = 3, 4, 6, 7	160 = 6, 8	212 = 3, 5, 7, 8
5 = 1, 3	57 = 1, 4, 5, 6	109 = 1, 3, 4, 6, 7	161 = 1, 6, 8	213 = 1, 3, 5, 7, 8
6 = 2, 3	58 = 2, 4, 5, 6	110 = 2, 3, 4, 6, 7	162 = 2, 6, 8	214 = 2, 3, 5, 7, 8
7 = 1, 2, 3	59 = 1, 2, 4, 5, 6	111 = 1, 2, 3, 4, 6, 7	163 = 1, 2, 6, 8	215 = 1, 2, 3, 5, 7, 8
8 = 4	60 = 3, 4, 5, 6	112 = 5, 6, 7	164 = 3, 6, 8	216 = 4, 5, 7, 8
9 = 1, 4	61 = 1, 3, 4, 5, 6	113 = 1, 5, 6, 7	165 = 1, 3, 6, 8	217 = 1, 4, 5, 7, 8
10 = 2, 4	62 = 2, 3, 4, 5, 6	114 = 2, 5, 6, 7	166 = 2, 3, 6, 8	218 = 2, 4, 5, 7, 8
11 = 1, 2, 4	63 = 1, 2, 3, 4, 5, 6	115 = 1, 2, 5, 6, 7	167 = 1, 2, 3, 6, 8	219 = 1, 2, 4, 5, 7, 8
12 = 3, 4	64 = 7	116 = 3, 5, 6, 7	168 = 4, 6, 8	220 = 3, 4, 5, 7, 8
13 = 1, 3, 4	65 = 1, 7	117 = 1, 3, 5, 6, 7	169 = 1, 4, 6, 8	221 = 1, 3, 4, 5, 7, 8
14 = 2, 3, 4	66 = 2, 7	118 = 2, 3, 5, 6, 7	170 = 2, 4, 6, 8	222 = 2, 3, 4, 5, 7, 8
15 = 1, 2, 3, 4	67 = 1, 2, 7	119 = 1, 2, 3, 5, 6, 7	171 = 1, 2, 4, 6, 8	223 = 1, 2, 3, 4, 5, 7, 8
16 = 5	68 = 3, 7	120 = 4, 5, 6, 7	172 = 3, 4, 6, 8	224 = 6, 7, 8
17 = 1, 5	69 = 1, 3, 7	121 = 1, 4, 5, 6, 7	173 = 1, 3, 4, 6, 8	225 = 1, 6, 7, 8
18 = 2, 5	70 = 2, 3, 7	122 = 2, 4, 5, 6, 7	174 = 2, 3, 4, 6, 8	226 = 2, 6, 7, 8
19 = 1, 2, 5	71 = 1, 2, 3, 7	123 = 1, 2, 4, 5, 6, 7	175 = 1,2, 3, 4, 6, 8	227 = 1, 2, 6, 7, 8
20 = 3, 5	72 = 4, 7	124 = 3, 4, 5, 6, 7	176 = 5, 6, 8	228 = 3, 6, 7, 8
21 = 1, 3, 5	73 = 1, 4, 7	125 = 1, 3, 4, 5, 6, 7	177 = 1, 5, 6, 8	229 = 1, 3, 6, 7, 8
22 = 2, 3, 5	74 = 2, 4, 7	126 = 2, 3, 4, 5, 6, 7	178 = 2, 5, 6, 8	230 = 2, 3, 6, 7, 8
23 = 1, 2, 3, 5	75 = 1, 2, 4, 7	127 = 1, 2, 3, 4, 5, 6, 7	179 = 1, 2, 5, 6, 8	231 = 1, 2, 3, 6, 7, 8
24 = 4, 5	76 = 3, 4, 7	128 = 8	180 = 3, 5, 6, 8	232 = 4, 6, 7, 8
25 = 1, 4, 5	77 = 1, 3, 4, 7	129 = 1, 8	181 = 1, 3, 5, 6, 8	233 = 1, 4, 6, 7, 8
26 = 2, 4, 5	78 = 2, 3, 4, 7	130 = 2, 8	182 = 2, 3, 5, 6, 8	234 = 2, 4, 6, 7, 8
27 = 1, 2, 4, 5	79 = 1, 3, 4, 7	131 = 1, 2, 8	183 = 1, 2, 3, 5, 6, 8	235 = 1, 2, 4, 6, 7, 8
28 = 3, 4, 5	80 = 5, 7	132 = 3, 8	184 = 4, 5, 6, 8	236 = 3, 4, 6, 7, 8
29 = 1, 3, 4, 5	81 = 1, 5, 7	133 = 1, 3, 8	185 = 1, 4, 5, 6, 8	237 = 1, 3, 4, 6, 7, 8
30 = 2, 3, 4, 5	82 = 2, 5, 7	134 = 2, 3, 8	186 = 2, 4, 5, 6, 8	238 = 2, 3, 4, 6, 7, 8
31 = 1, 2, 3, 4, 5	83 = 1, 2, 5, 7	135 = 1, 2, 3, 8	187 = 1, 2, 4, 5, 6, 8	239 = 1, 2, 3, 4, 6, 7, 8
32 = 6	84 = 3, 5, 7	136 = 4, 8	188 = 3, 4, 5, 6, 8	240 = 5, 6, 7, 8
33 = 1, 6	85 = 1, 3, 5, 7	137 = 1, 4, 8	189 = 1, 3, 4, 5, 6, 8	241 = 1, 5, 6, 7, 8
34 = 2, 6	86 = 2, 3, 5, 7	138 = 2, 4, 8	190 = 2, 3, 4, 5, 6, 8	242 = 2, 5, 6, 7, 8
35 = 1, 2, 6	87 = 1, 2, 3, 5, 7	139 = 1, 2, 4, 8	191 = 1, 2, 3, 4, 5, 6, 8	243 = 1, 2, 5, 6, 7, 8
36 = 3, 6	88 = 4, 5, 7	140 = 3, 4, 8	192 = 7, 8	244 = 3, 5, 6, 7, 8
37 = 1, 3, 6	89 = 1, 4, 5, 7	141 = 1, 3, 4, 8	193 = 1, 7, 8,	245 = 1, 3, 5, 6, 7, 8
38 = 2, 3, 6	90 = 2, 4, 5, 7	142 = 2, 3, 4, 8	194 = 2, 7, 8,	246 = 2, 3, 5, 6, 7, 8
39 = 1, 2, 3, 6	91 = 1, 2, 4, 5, 7	143 = 1, 2, 3, 4, 8	195 = 1, 2, 7, 8	247 = 1, 2, 3, 5, 6, 7, 8
40 = 4, 6	92 = 3, 4, 5, 7	144 = 5, 8	196 = 3, 7, 8	248 = 4, 5, 6, 7, 8
41 = 1, 4, 6	93 = 1, 3, 4, 5, 7	145 = 1, 5, 8	197 = 1, 3, 7, 8	249 = 1, 4, 5, 6, 7, 8
42 = 2, 4, 6	94 = 2, 3, 4, 5, 7	146 = 2, 5, 8	198 = 2, 3, 7, 8	250 = 2, 4, 5, 6, 7, 8
43 = 1, 2, 4, 6	95 = 1, 2, 3, 4, 5, 7	147 = 1, 2, 5, 8	199 = 1, 2, 3, 7, 8	251 = 1, 2, 4, 5, 6, 7, 8
44 = 3, 4, 6,	96 = 6, 7	148 = 3, 5, 8	200 = 4, 7, 8,	252 = 3, 4, 5, 6, 7, 8
45 = 1, 3, 4, 6	97 = 1, 6, 7	149 = 1, 3, 5, 8	201 = 1, 4, 7, 8	253 = 1, 3, 4, 5, 6, 7, 8
46 = 2, 3, 4, 6	98 = 2, 6, 7	150 = 2, 3, 5, 8	202 = 2, 4, 7, 8	254 = 2, 3, 4, 5, 6, 7, 8
47 = 1, 2, 3, 4, 6	99 = 1, 2, 6, 7	151 = 1, 2, 3, 5, 8	203 = 1, 2, 4, 7, 8	255 = 1, 2, 3, 4, 5, 6, 7, 8
48 = 5, 6	100 = 3, 6, 7	152 = 4, 5, 8	204 = 3, 4, 7, 8	256 = 9
49 = 1, 5, 6	101 = 1, 3, 6, 7	153 = 1, 4, 5, 8	205 = 1, 3, 4, 7, 8	257 = 1, 9
50 = 2, 5, 6	102 = 2, 3, 6, 7	154 = 2, 4, 5, 8	206 = 2, 3, 4, 7, 8	258 = 2, 9
51 = 1, 2, 5, 6	103 = 1, 2, 3, 6, 7	155 = 1, 2, 4, 5, 8	207 = 1, 2, 3, 4, 7, 8	259 = 1, 2, 9
52 = 3, 5, 6	104 = 4, 6, 7	156 = 3, 4, 5, 8	208 = 5, 7, 8	260 = 3, 9

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DMX Address Chart Cont.

Ch - Switches	Ch - Switches	Ch - Switches	Ch - Switches	Ch - Switches
261 = 1, 3, 9	322 = 2, 7, 9	383 = 1, 2, 3, 4, 5, 6, 7, 9	444 = 3, 4, 5, 6, 8, 9	505 = 1, 4, 5, 6, 7, 8, 9
262 = 2, 3, 9	323 = 1, 2, 7, 9	384 = 8, 9	445 = 1, 3, 4, 5, 6, 8, 9	506 = 2, 4, 5, 6, 7, 8, 9
263 = 1, 2, 3, 9	324 = 3, 7, 9	385 = 1, 8, 9	446 = 2, 3, 4, 5, 6, 8, 9	507 = 1, 2, 4, 5, 6, 7, 8, 9
264 = 4, 9	325 = 1, 3, 7, 9	386 = 2, 8, 9	447 = 1, 2, 3, 4, 5, 6, 8, 9	508 = 3, 4, 5, 6, 7, 8, 9
265 = 1, 4, 9	326 = 2, 3, 7, 9	387 = 1, 2, 8, 9	448 = 7, 8, 9	509 = 1, 3, 4, 5, 6, 7, 8, 9
266 = 2, 4, 9	327 = 1, 2, 3, 7, 9	388 = 3, 8, 9	449 = 1, 7, 8, 9	510 = 2, 3, 4, 5, 6, 7, 8, 9
267 = 1, 2, 4, 9	328 = 4, 7, 9	389 = 1, 3, 8, 9	450 = 2, 7, 8, 9	511 = 1, 2, 3, 4, 5, 6, 7, 8, 9
268 = 3, 4, 9	329 = 1, 4, 7, 9	390 = 2, 3, 8, 9	451 = 1, 2, 7, 8, 9	512 = 0
269 = 1, 3, 4, 9	330 = 2, 4, 7, 9	391 = 1, 2, 3, 8, 9	452 = 3, 7, 8, 9	
270 = 2, 3, 4, 9	331 = 1, 2, 4, 7, 9	392 = 4, 8, 9	453 = 1, 3, 7, 8, 9	
271 = 1, 2, 3, 4, 9	332 = 3, 4, 7, 9	393 = 1, 4, 8, 9	454 = 2, 3, 7, 8, 9	
272 = 5, 9	333 = 1, 3, 4, 7, 9	394 = 2, 4, 8, 9	455 = 1, 2, 3, 7, 8, 9	
273 = 1, 5, 9	334 = 2, 3, 4, 7, 9	395 = 1, 2, 4, 8, 9	456 = 4, 7, 8, 9	
274 = 2, 5, 9	335 = 1, 2, 3, 4, 7, 9	396 = 3, 4, 8, 9	457 = 1, 4, 7, 8, 9	
275 = 1, 2, 5, 9	336 = 5, 7, 9	397 = 1, 3, 4, 8, 9	458 = 2, 4, 7, 8, 9	
276 = 3, 5, 9	337 = 1, 5, 7, 9	398 = 2, 3, 4, 8, 9	459 = 1, 2, 4, 7, 8, 9	
277 = 1, 3, 5, 9	338 = 2, 5, 7, 9	399 = 1, 2, 3, 4, 8, 9	460 = 3, 4, 7, 8, 9	
278 = 2, 3, 5, 9	339 = 1, 2, 5, 7, 9	400 = 5, 8, 9	461 = 1, 3, 4, 7, 8, 9	
279 = 1, 2, 3, 5, 9	340 = 3, 5, 7, 9	401 = 1, 5, 8, 9	462 = 2, 3, 4, 7, 8, 9	
280 = 4, 5, 9	341 = 1, 3, 5, 7, 9	402 = 2, 5, 8, 9	463 = 1, 2, 3, 4, 7, 8, 9	
281 = 1, 4, 5, 9	342 = 2, 3, 5, 7, 9	403 = 1, 2, 5, 8, 9	464 = 5, 7, 8, 9	
282 = 2, 4, 5, 9	343 = 1, 2, 3, 5, 7, 9	404 = 3, 5, 8, 9	465 = 1, 5, 7, 8, 9	
283 = 1, 2, 4, 5, 9	344 = 4, 5, 7, 9	405 = 1, 3, 5, 8, 9	466 = 2, 5, 7, 8, 9	
284 = 3, 4, 5, 9	345 = 1, 4, 5, 7, 9	406 = 2, 3, 5, 8, 9	467 = 1, 2, 5, 7, 8, 9	
285 = 1, 3, 4, 5, 9	346 = 2, 4, 5, 7, 9	407 = 1, 2, 3, 5, 8, 9	468 = 3, 5, 7, 8, 9	
286 = 2, 3, 4, 5, 9	347 = 1, 2, 4, 5, 7, 9	408 = 4, 5, 8, 9	469 = 1, 3, 5, 7, 8, 9	
287 = 1, 2, 3, 4, 5, 9	348 = 3, 4, 5, 7, 9	409 = 1, 4, 5, 8, 9	470 = 2, 3, 5, 7, 8, 9	
288 = 6, 9	349 = 1, 3, 4, 5, 7, 9	410 = 2, 4, 5, 8, 9	471 = 1, 2, 3, 5, 7, 8, 9	
289 = 1, 6, 9	350 = 2, 3, 4, 5, 7, 9	411 = 1, 2, 4, 5, 8, 9	472 = 4, 5, 7, 8, 9	
290 = 2, 6, 9	351 = 1, 2, 3, 4, 5, 7, 9	412 = 3, 4, 5, 8, 9	473 = 1, 4, 5, 7, 8, 9	
291 = 1, 2, 6, 9	352 = 6, 7, 9	413 = 1, 3, 4, 5, 8, 9	474 = 2, 4, 5, 7, 8, 9	
292 = 3, 6, 9	353 = 1, 6, 7, 9	414 = 2, 3, 4, 5, 8, 9	475 = 1, 2, 4, 5, 7, 8, 9	
293 = 1, 3, 6, 9	354 = 2, 6, 7, 9	415 = 1, 2, 3, 4, 5, 8, 9	476 = 3, 4, 5, 7, 8, 9	
294 = 2, 3, 6, 9	355 = 1, 2, 6, 7, 9	416 = 6, 8, 9	477 = 1, 3, 4, 5, 7, 8, 9	
295 = 1, 2, 3, 6, 9	356 = 3, 6, 7, 9	417 = 1, 6, 8, 9	478 = 2, 3, 4, 5, 7, 8, 9	
296 = 4, 6, 9	357 = 1, 3, 6, 7, 9	418 = 2, 6, 8, 9	479 = 1, 2, 3, 4, 5, 7, 8, 9	
297 = 1, 4, 6, 9	358 = 2, 3, 6, 7, 9	419 = 1, 2, 6, 8, 9	480 = 6, 7, 8, 9	
298 = 2, 4, 6, 9	359 = 1, 2, 3, 6, 7, 9	420 = 3, 6, 8, 9	481 = 1, 6, 7, 8, 9	
299 = 1, 2, 4, 6, 9	360 = 4, 6, 7, 9	421 = 1, 3, 6, 8, 9	482 = 2, 6, 7, 8, 9	
300 = 3, 4, 6, 9	361 = 1, 4, 6, 7, 9	422 = 2, 3, 6, 8, 9	483 = 1, 2, 6, 7, 8, 9	
301 = 1, 3, 4, 6, 9	362 = 2, 4, 6, 7, 9	423 = 1, 2, 3, 6, 8, 9	484 = 3, 6, 7, 8, 9	
302 = 2, 3, 4, 6, 9	363 = 1, 2, 4, 6, 7, 9	424 = 4, 6, 8, 9	485 = 1, 3, 6, 7, 8, 9	
303 = 1, 2, 3, 4, 6, 9	364 = 3, 4, 6, 7, 9	425 = 1, 4, 6, 8, 9	486 = 2, 3, 6, 7, 8, 9	
304 = 5, 6, 9	365 = 1, 3, 4, 6, 7, 9	426 = 2, 4, 6, 8, 9	487 = 1, 2, 3, 6, 7, 8, 9	
305 = 1, 5, 6, 9	366 = 2, 3, 4, 6, 7, 9	427 = 1, 2, 4, 6, 8, 9	488 = 4, 6, 7, 8, 9	
306 = 2, 5, 6, 9	367 = 1, 2, 3, 4, 6, 7, 9	428 = 3, 4, 6, 8, 9	489 = 1, 4, 6, 7, 8, 9	
307 = 1, 2, 5, 6, 9	368 = 5, 6, 7, 9	429 = 1, 3, 4, 6, 8, 9	490 = 2, 4, 6, 7, 8, 9	
308 = 3, 5, 6, 9	369 = 1, 5, 6, 7, 9	430 = 2, 3, 4, 6, 8, 9	491 = 1, 2, 4, 6, 7, 8, 9	
309 = 1, 3, 5, 6, 9	370 = 2, 5, 6, 7, 9	431 = 1, 2, 3, 4, 6, 8, 9	492 = 3, 4, 6, 7, 8, 9	
310 = 2, 3, 5, 6, 9	371 = 1, 2, 5, 6, 7, 9	432 = 5, 6, 8, 9	493 = 1, 3, 4, 6, 7, 8, 9	
311 = 1, 2, 3, 5, 6, 9	372 = 3, 5, 6, 7, 9	433 = 1, 5, 6, 8, 9	494 = 2, 3, 4, 6, 7, 8, 9	
312 = 4, 5, 6, 9	373 = 1, 3, 5, 6, 7, 9	434 = 2, 5, 6, 8, 9	495 = 1, 2, 3, 4, 6, 7, 8, 9	
313 = 1, 4, 5, 6, 9	374 = 2, 3, 5, 6, 7, 9	435 = 1, 2, 5, 6, 8, 9	496 = 5, 6, 7, 8, 9,	
314 = 2, 4, 5, 6, 9	375 = 1, 2, 3, 5, 6, 7, 9	436 = 3, 5, 6, 8, 9	497 = 1, 5, 6, 7, 8, 9	
315 = 1, 2, 4, 5, 6, 9	376 = 4, 5, 6, 7, 9	437 = 1, 3, 5, 6, 8, 9	498 = 2, 5, 6, 7, 8, 9	
316 = 3, 4, 5, 6, 9	377 = 1, 4, 5, 6, 7, 9	438 = 2, 3, 5, 6, 8, 9	499 = 1, 2, 5, 6, 7, 8, 9	
317 = 1, 3, 4, 5, 6, 9	378 = 2, 4, 5, 6, 7, 9	439 = 1, 2, 3, 5, 6, 8, 9	500 = 3, 5, 6, 7, 8, 9	
318 = 2, 3, 4, 5, 6, 9	379 = 1, 2, 4, 5, 6, 7, 9	440 = 4, 5, 6, 8, 9	501 = 1, 3, 5, 6, 7, 8, 9	
329 = 1, 2, 3, 4, 5, 6, 9	380 = 3, 4, 5, 6, 7, 9	441 = 1, 4, 5, 6, 8, 9	502 = 2, 3, 5, 6, 7, 8, 9	
320 = 7, 9	381 = 1, 3, 4, 5, 6, 7, 9	442 = 2, 4, 5, 6, 8, 9	503 = 1, 2, 3, 5, 6, 7, 8, 9	
321 = 1, 7, 9	382 = 2, 3, 4, 5, 6, 7, 9	443 = 1, 2, 4, 5, 6, 8, 9	504 = 4, 5, 6, 7, 8, 9