

Owner's Manual



DMX-512 to Multiplex Protocol Translator

MODEL NUMBERS 512264, 512264M & 512264S

DMX-tools Co.

REGULATORY COMPLIANCE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not used and installed in accordance with the instructions, may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the unit on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- ?? Reorient or relocate the receiving antenna.
- ?? Increase the separation between the equipment and the receiver.
- ?? Connect the equipment to an outlet on a different circuit from that to which the receiver is connected.
- ?? Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that changes and modifications made to this equipment without the approval of the manufacturer could void the user's authority to operate the equipment. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment.

SAFETY INSTRUCTIONS

CAUTION: To reduce the risk of electrical shock, do not remove the cover. No user-serviceable parts inside; refer servicing to qualified service personnel.

WARNING: To reduce the risk of fire or electrical shock, do not expose this device to rain or moisture.

WARNING: To avoid damage to DMX-512 equipment, NEVER connect it directly to multiplex equipment. Multiplex signal levels are up to 6 times those used for DMX-512 and WILL cause damage.

Dear Customer,

Multiplex remote control systems use a single twisted pair, usually standard microphone cable, to send control signals to several dimmers or relays using analog time-division multiplexing. NSI Microplex, James Lighting MUX-64 and Lightronics LMX are examples. Some systems can put as many as 128 channels on one cable.

In 1986, the U.S. Institute of Theater Technology (USITT) published the specification for a new dimmer control protocol called DMX-512. DMX-512 also sends the controls as low-voltage signals over a single twisted pair, but it uses digital signals, which are more resistant to electrical noise and can handle more data; control for up to 512 channels can pass over a single cable. In 1990, the standard was revised, relaxing some of the timing requirements and making it easier to manufacture compliant equipment.

As an industry standard, DMX-512 allows controllers, dimmers and effects from any manufacturer to work with those from any other manufacturer. Many companies now manufacture DMX-512 dimmers and controllers. Almost all moving-light effects use DMX-512.

This poses a problem for anyone wanting to upgrade an existing multiplex system. Adding new DMX-512 effects means adding a DMX-512 controller. In itself this isn't bad, because of the larger number of control channels and because, with many companies in the DMX-512 market, competition has pushed prices pretty low. However, moving the existing lights to the DMX controller meant replacing all the multiplex dimmers with DMX dimmers, a costly proposition even though DMX dimmers are usually less expensive than similar multiplex units.

It's a proposition I had to face as a concert sound-and-lighting contractor. When I upgraded my concert system, I lived with two controllers, a James Model 916 for my 32 channels of multiplex dimmers and an American DJ "DMX Operator" for my moving-light effects. Having separate controllers for the dimmers and the moving effects made it difficult to choreograph a decent light show but I couldn't afford to replace a couple thousand dollars-worth of dimmers all at once.

Because my background is in electronic engineering, I decided to do something about it. My *DMX-lator* I can make a system of up to 128 channels of multiplex dimmers and relays work with a new DMX-512 controller. It lets me operate my multiplex dimmers, as well as my moving-light effects, from my American DJ "DMX Operator" controller.

I cut costs by using a cheap, off-the-shelf, plastic box instead of a custom-designed cabinet, using "dipswitches" for addressing and using generic bubble-wrap and a standard-size plain white box for packaging. I spent the savings on things like added protection against static electricity and ways to avoiding generating electrical noise that might get into the

PA or a guitar amp. I designed it, first, for my own use... and I don't like technical difficulties interfering with my shows.

Before offering it for sale, in March of 2003, I tested it with dimmer packs from other manufacturers as well as using it regularly with my James Lighting dimmers. As of January, 2006, I have well over a hundred units in the field, working well with James MUX-64 dimmer packs and dim-bars, Lightronics LMX, ETA Ultra-plex, Sunn MPX and NSI microplex and microplex-128 dimmer packs, and a few Leprecon microplex-compatible dimmer packs.

I still do concert sound and lights – and use that as an ongoing check of product quality. I'm still pleased with my design and kind of proud of it. I hope you're as happy with it as I am.

dmx-tools@ameritech.net

January 17, 2006

Addressing

Whether it's DMX-512 or multiplex, each dimmer, relay pack or effect has an address (some have several). It's how one associates a device on stage to a fader or switch on the controller. The DMX-512 protocol has 512 addresses available, while the multiplex output of the *DMX-lator I* has 32, 40, 64 or 128, depending on the configuration purchased. The standard version (512264) will translate 64 channels, for James Lighting MUX-64 and older NSI microplex packs. Sunn and ETA dimmer packs can only decode 32 addresses and are confused if they receive more than 32 channels of data. The Sunn/ETA version (512254S) is limited to 32 channels of output to allow them to operate properly. The microplex-128 version (512264M) translates a full 128 channels, for dimmer packs from NSI, Leprecon and Lightronics that can take advantage of the larger address space. Sunn, ETA and James Lighting dimmers will be confused by the extra data. All versions automatically switch to 40 channels with a variation in the sync signal when attached to older Lightronics dimmer packs

The address switches on the *DMX-lator I* map the addresses of the multiplex string into a contiguous block of addresses within the 512 available to a DMX-512 controller. Note the numbers beside each switch. The DMX address of each dimmer is the sum of its multiplex address plus the *DMX-lator I* switch settings. For example, I may want to assign DMX-512 addresses 1-48 to moving light effects, then put my multiplex dimmers at addresses 49-112. I would simply set the *DMX-lator I* address switches to address 48, one less than the starting address I want to assign to the multiplex block.



To start the multiplex string at DMX address 49, turn switches 32 and 16 on and turn everything else off. $32+16=48$. The DMX address of each Multiplex fixture will be that fixture's multiplex address plus 48. Multiplex channel 1 becomes DMX channel 49; multiplex channel 13 becomes DMX channel 61 and so on.

In most cases, you'll work it backwards. Assume you want to start the multiplex string at DMX address 408. Start by subtracting 1. This leaves you with 407.

256 is smaller than 407, so turn on 256 and subtract it from 407. $407-256=151$. 128 is smaller than 151, so turn on 128 and subtract it from 151. $151-128=23$. 64 is larger than 23, so turn that switch off. 32 is larger than 23, so turn that switch off, too. 16 is smaller than 23, so turn on 16 and subtract it from 23. $23-16=7$. 8 is larger than 7, so turn that switch off. 4 is smaller than 7, so turn that switch on and subtract it. $7-4=3$. 2 is smaller than 3 so turn that switch on and subtract it. $3-2=1$. Turn the 1 switch on and subtract it. $1-1=0$. When you get to 0, you're done. If the math seems a bit much, refer to appendix C.

Note that assigning a block of addresses to multiplex devices does not remove those addresses from the DMX side. This allows you to operate a DMX dimmer and a multiplex dimmer from the same fader at the same time, if you so desire.

Connections

DMX-512 was originally specified to use 5-pin XLR connectors. Some manufacturers use 3-pin XLR connectors in cases where the second, return channel is not being used. The *DMX-lator I* uses this 3-pin variation, both for compatibility with the inexpensive American DJ controller and fixtures I use and because multiplex has no return channel to convert (and, honestly, because PCB-mounted 5-pin XLR connectors are much more expensive). If your DMX-512 gear requires the 5-pin connectors, 3-pin to 5-pin and 5-pin to 3-pin adapters are readily available. Instructions for building your own adapters are included in appendix A.

DMX-512 signals are fast, so DMX-512 lines must be terminated for reliable operation. This simply means placing a resistor across the two signal leads at the end of the line farthest from the controller. The resistor value must be close to the characteristic impedance of the cable

being used – for standard microphone cable, 110-120 ohms. Instructions for building your own terminator are included in appendix B.

All the various multiplex protocols the *DMX-lator I* was designed for use 3-pin XLR connectors on standard microphone cable. Multiplex lines should not be terminated. Make certain the cables used are wired correctly: pin 1 to pin 1, pin 2 to pin 2 and pin 3 to pin 3. Because the dimmer pack sends power back up the cable, switching connections within the cable may damage either the dimmer pack or the *DMX-lator I*.

The *DMX-lator I* is always the start of the multiplex string, effectively replacing the controller. It's even powered by the multiplex dimmers. Connect the multiplex dimmers first. Apply power to the nearest multiplex dimmer or relay pack. It sends power back up the cable to the *DMX-lator I*. The “ALIVE” LED, located between the two DMX-512 connectors, should flash. If it doesn't flash, re-check your wiring. Ensure that the multiplex dimmer is powered and working properly.

Once you get the “ALIVE” LED to flash, power down the multiplex dimmer or relay pack and connect the DMX side. The *DMX-lator I* will not be damaged if you accidentally connect a multiplex device to a DMX connector; it simply won't work. Connecting the multiplex side first, and making the “ALIVE” LED flash, ensures that you have the multiplex connection in the right place and helps avoid accidentally damaging other DMX gear.

The *DMX-lator I* can be placed anywhere in the DMX-512 chain. DMX devices are selected by their address, not their physical position. If most of your DMX-512 gear uses 5-pin connectors, it would be best to place the *DMX-lator I* at the end of the chain so that you only need one 5-pin to 3-pin adapter. Any DMX-512 devices that actually use the secondary channel MUST be connected between the controller and the *DMX-lator I* or any other 3-pin DMX devices. Otherwise, because it acts as a repeater for DMX-512 signals, placing it near the center of the string is better (for reliable operation DMX-512 strings should have a repeater every 32 devices or less).

Mounting

Included with the *DMX-lator I* is a strip of gum-backed Velcro? . A matching strip is pre-applied to the back of the *DMX-lator I*. The *DMX-lator I* may be mounted in any position. In cases where the *DMX-lator I* is mounted somewhere in the rigging, on a lighting truss or tree, it may be useful to position it such that the “ALIVE” LED is visible from the ground.

Operation

Once the address switches have been set and the cables connected, there are no further actions required of the user specific to the *DMX-lator I*. The *DMX-lator I* is powered by the dimmers on the multiplex side. It turns on and off with them. A relay in the *DMX-lator I* bypasses the DMX side if the multiplex dimmers are powered off or the multiplex cable becomes disconnected, allowing other DMX devices to continue functioning.

Maintenance

The *DMX-lator I* should require no user maintenance beyond periodic dusting. If further cleaning is required, surfaces may be wiped with a damp (not wet) cloth. The use of solvents or abrasive cleaners should be avoided.

Troubleshooting

Most problems can be traced to either improper address-switch settings on the *DMX-lator I* or on one or more of the dimmers, faulty cables or failure to properly terminate DMX-512 lines. Currently, I'm only offering technical support by e-mail: dmx-tools@ameritech.net.

Specifications

Physical:

Weight:	12 Oz.
Dimensions:	5.25" H X 3.5" W X 1.5" D

Functional:

Ambient temperature:	0-120? F
Relative Humidity:	0-90% non-condensing
Shock and vibration:	5G

Electrical:

Power:	15VDC @ 90mA (supplied by the multiplex dimmer-pack)
Multiplex refresh rate:	44Hz
Latency:	45mS (this is the worst-case delay between the DMX-512 input and the multiplex output)

LIMITED WARRANTY

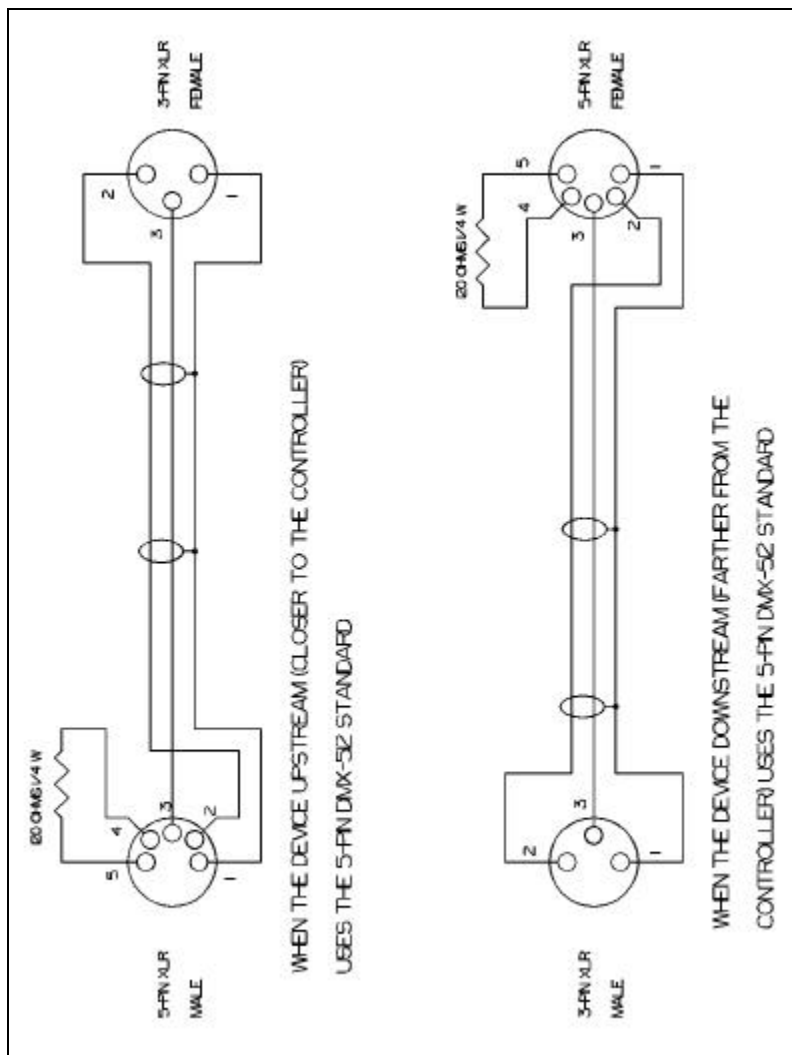
1. DMX-tools Co. warrants the *DMX-lator I* to be free from defects in design, materials or workmanship for a period of two years from the date of purchase. If any such defect occurs within the warranty period, DMX-tools Co. will, at our sole discretion, repair or replace the unit.
2. Specifically excluded from this warranty are damages/defects caused by:
 - ?? misuse, abuse, neglect or failure to install or operate the unit in accordance with the instructions given in this User's Manual.
 - ?? fire, flood, acts of God or natural disasters.
 - ?? war, revolution, riot or other armed conflict.
 - ?? use of the device as the 'ball,' 'puck', 'birdie' or 'target' in any sporting event or similar activity.
3. Any repair or modification by unauthorized persons will void this warranty.
4. This warranty applies to the original retail purchaser only.
5. Warranty service will be provided only if the returned product is accompanied by an original retail dealer's invoice or sales receipt (proof of purchase/purchase date).
6. For warranty service, the product must be returned, postage paid, in its original packaging to

**DMX-TOOLS CO.
424 FRANKLIN BLVD.
ELGIN, IL 60120-4439**

Please include a description of the fault or failure and a contact name and phone number and/or e-mail address.

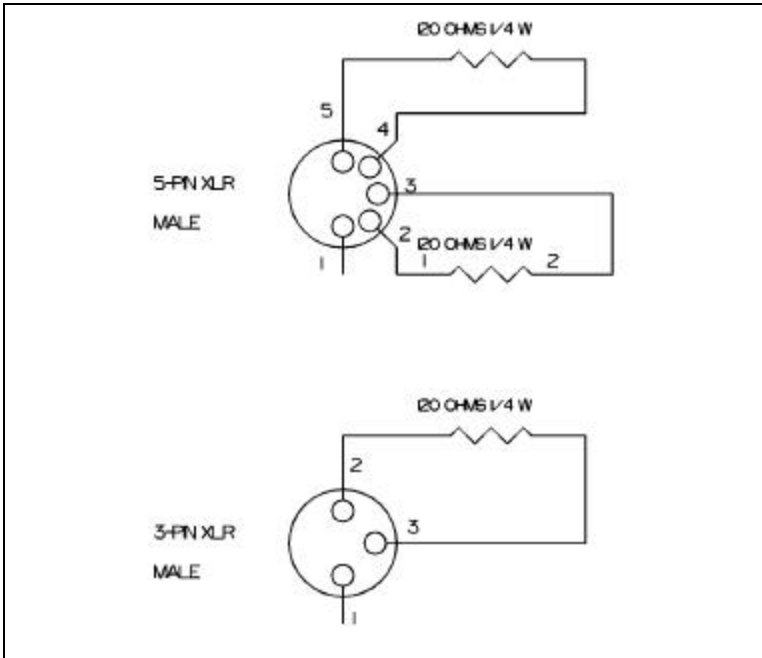
7. Items meeting the above requirements for warranty service will be repaired or replaced and returned within 30 days.
8. Items not meeting the requirements for warranty service will elicit a call or e-mail to the contact name and number. You will be given the option of paying for service or having the item returned as-is.

APPENDIX A



Five-pin to three-pin XLR adapters

APPENDIX B



DMX-512 TERMINATORS

A DMX-512 terminator can be easily built into a cable-mounted male XLR connector, per the above diagrams. A terminator should be connected to the DMX OUT jack on the LAST device in the DMX-512 chain (the device furthest from the controller).

Appendix C - Address Chart

In this chart, the Address column is the DMX-512 address of the first MUX channel. In the Switches column, 0 = OFF and 1 = ON. Digits left-to-right correspond to switches top-to-bottom.

Addr.	Switches
1	00000000
2	00000001
3	00000010
4	00000011
5	00000100
6	00000101
7	00000110
8	00000111
9	000001000
10	000001001
11	000001010
12	000001011
13	000001100
14	000001101
15	000001110
16	000001111
17	000010000
18	000010001
19	000010010
20	000010011
21	000010100
22	000010101
23	000010110
24	000010111
25	000011000
26	000011001
27	000011010
28	000011011
29	000011100
30	000011101
31	000011110
32	000011111
33	000100000
34	000100001
35	000100010
36	000100011
37	000100100
38	000100101
39	000100110
40	000100111
41	000101000
42	000101001
43	000101010
44	000101011
45	000101100
46	000101101
47	000101110
48	000101111
49	000110000
50	000110001

Addr.	Switches
51	000110010
52	000110011
53	000110100
54	000110101
55	000110110
56	000110111
57	000111000
58	000111001
59	000111010
60	000111011
61	000111100
62	000111101
63	000111110
64	000111111
65	001000000
66	001000001
67	001000010
68	001000011
69	001000100
70	001000101
71	001000110
72	001000111
73	001001000
74	001001001
75	001001010
76	001001011
77	001001100
78	001001101
79	001001110
80	001001111
81	001010000
82	001010001
83	001010010
84	001010011
85	001010100
85	001010101
87	001010110
88	001010111
89	001011000
90	001011001
91	001011010
92	001011011
93	001011100
94	001011101
95	001011110
96	001011111
97	001100000
98	001100001
99	001100010
100	001100011

Addr.	Switches
101	001100100
102	001100101
103	001100110
104	001100111
105	001101000
106	001101001
107	001101010
108	001101011
109	001101100
110	001101101
111	001101110
112	001101111
113	001110000
114	001110001
115	001110010
116	001110011
117	001110100
118	001110101
119	001110110
120	001110111
121	001111000
122	001111001
123	001111010
124	001111011
125	001111100
126	001111101
127	001111110
128	001111111
129	010000000
130	010000001
131	010000010
132	010000011
133	010000100
134	010000101
135	010000110
136	010000111
137	010001000
138	010001001
139	010001010
140	010001011
141	010001100
142	010001101
143	010001110
144	010001111
145	010010000
146	010010001
147	010010010
148	010010011
149	010010100
150	010010101

Addr.	Switches
151	010010110
152	010010111
153	010011000
154	010011001
155	010011010
156	010011011
157	010011100
158	010011101
159	010011110
160	010011111
161	010100000
162	010100001
163	010100010
164	010100011
165	010100100
166	010100101
167	010100110
168	010100111
169	010101000
170	010101001
171	010101010
172	010101011
173	010101100
174	010101101
175	010101110
176	010101111
177	010110000
178	010110001
179	010110010
180	010110011
181	010110100
182	010110101
183	010110110
184	010110111
185	010111000
186	010111001
187	010111010
188	010111011
189	010111100
190	010111101
191	010111110
192	010111111
193	011000000
194	011000001
195	011000010
196	011000011
197	011000100
198	011000101
199	011000110
200	011000111
201	011001000
202	011001001
203	011001010
204	011001011
205	011001100
206	011001101
207	011001110
208	011001111
209	011010000

Addr.	Switches
210	011010001
211	011010010
212	011010011
213	011010100
214	011010101
215	011010110
216	011010111
217	011011000
218	011011001
219	011011010
220	011011011
221	011011100
222	011011101
223	011011110
224	011011111
225	011100000
226	011100001
227	011100010
228	011100011
229	011100100
230	011100101
231	011100110
232	011100111
233	011101000
234	011101001
235	011101010
236	011101011
237	011101100
238	011101101
239	011101110
240	011101111
241	011110000
242	011110001
243	011110010
244	011110011
245	011110100
246	011110101
247	011110110
248	011110111
249	011111000
250	011111001
251	011111010
252	011111011
253	011111100
254	011111101
255	011111110
256	011111111
257	100000000
258	100000001
259	100000010
260	100000011
261	100000100
262	100000101
263	100000110
264	100000111
265	100001000
266	100001001
267	100001010
268	100001011

Addr.	Switches
269	100001100
270	100001101
271	100001110
272	100001111
273	100010000
274	100010001
275	100010010
276	100010011
277	100010100
278	100010101
279	100010110
280	100010111
281	100011000
282	100011001
283	100011010
284	100011011
285	100011100
286	100011101
287	100011110
288	100011111
289	100100000
290	100100001
291	100100010
292	100100011
293	100100100
294	100100101
295	100100110
296	100100111
297	100101000
298	100101001
299	100101010
300	100101011
301	100101100
302	100101101
303	100101110
304	100101111
305	100110000
306	100110001
307	100110010
308	100110011
309	100110100
310	100110101
311	100110110
312	100110111
313	100111000
314	100111001
315	100111010
316	100111011
317	100111100
318	100111101
319	100111110
320	100111111
321	101000000
322	101000001
323	101000010
324	101000011
325	101000100
326	101000101
327	101000110

Addr.	Switches
328	101000111
329	101001000
330	101001001
331	101001010
332	101001011
333	101001100
334	101001101
335	101001110
336	101001111
337	101010000
338	101010001
339	101010010
340	101010011
341	101010100
342	101010101
343	101010110
344	101010111
345	101011000
346	101011001
347	101011010
348	101011011
349	101011100
350	101011101
351	101011110
352	101011111
353	101100000
354	101100001
355	101100010
356	101100011
357	101100100
358	101100101
359	101100110
360	101100111
361	101101000
362	101101001
363	101101010
364	101101011
365	101101100
366	101101101
367	101101110
368	101101111
369	101110000
370	101110001
371	101110010
372	101110011
373	101110100
374	101110101
375	101110110
376	101110111
377	101111000
378	101111001
379	101111010
380	101111011
381	101111100
382	101111101
383	101111110
384	101111111
385	110000000
386	110000001

Addr.	Switches
387	110000010
388	110000011
389	110000100
390	110000101
391	110000110
392	110000111
393	110001000
394	110001001
395	110001010
396	110001011
397	110001100
398	110001101
399	110001110
400	110001111
401	110010000
402	110010001
403	110010010
404	110010011
405	110010100
406	110010101
407	110010110
408	110010111
409	110011000
410	110011001
411	110011010
412	110011011
413	110011100
414	110011101
415	110011110
416	110011111
417	110100000
418	110100001
419	110100010
420	110100011
421	110100100
422	110100101
423	110100110
424	110100111
425	110101000
426	110101001
427	110101010
428	110101011
429	110101100
430	110101101
431	110101110
432	110101111
433	110110000
434	110110001
435	110110010
436	110110011
437	110110100
438	110110101
439	110110110
440	110110111
441	110111000
442	110111001
443	110111010
444	110111011
445	110111100

Addr.	Switches
446	110111101
447	110111110
448	110111111
449	111000000
450	111000001
451	111000010
452	111000011
453	111000100
454	111000101
455	111000110
456	111000111
457	111001000
458	111001001
459	111001010
460	111001011
461	111001100
462	111001101
463	111001110
464	111001111
465	111010000
466	111010001
467	111010010
468	111010011
469	111010100
470	111010101
471	111010110
472	111010111
473	111011000
474	111011001
475	111011010
476	111011011
477	111011100
478	111011101
479	111011110
480	111011111
481	111100000
482	111100001
483	111100010
484	111100011
485	111100100
486	111100101
487	111100110
488	111100111
489	111101000
490	111101001
491	111101010
492	111101011
493	111101100
494	111101101
495	111101110
496	111101111
497	111110000
498	111110001
499	111110010
500	111110011
501	111110100
502	111110101
503	111110110
504	111110111

Addr.	Switches
505	111111000
506	111111001
507	111111010
508	111111011
509	111111100
510	111111101
511	111111110
512	111111111

P/N 5122646

Revision G

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