BSR E1.68, Recommended Practice for Compliance and Interoperability in DMX512-A Systems
First public review comment resolutions

Referenced documents: BSR E1.68, Recommended Practice for Compliance and Interoperability in DMX512-A Systems (doc. number CP/2021-1003r1)

ANSI public review period: 8 April through 23 May 2022

Question: What is your opinion of BSR E1.68? Is it good as it is, is it good but could be better, or is it unacceptable?

Responses:

Person	Representing	It's good.	It's good but could be better.	It's unacceptable.
Steve Terry (ST)	ETC			**X**
Bob Goddard (BG)	Goddard Design Co.		**X**	

Regarding his comments, Bob Goddard wrote:
red with strikeout = Delete text, changed to black strikeout
blue with underline =Add text, changed to black underlined
black = old text, changed to black unformatted text

Specific comments:

#	Commenter	Relevant clause	Comment	Proposed Resolution
1	ST	5.6.2	Section 5.6.2 calls out safety, security, and emergency lighting as prohibited "hazardous" applications of DMX512. There is no normative requirement in the E1.11 standard to support this prohibition. This means that E1.58 is creating a normative requirement where none exists and none is warranted. This is an editorial overreach, and is a problem for the specific reasons outlined below. It is made more severe by the fact that this E1.68 "Recommended Practice for Compliance and Interoperability in DMX512-A Systems" comes from the same SDO that created the original E1.11 standard. It is therefore not unreasonable to assume that the market will interpret this E1.68 "recommendation" on safety, security, and emergency lighting as a defacto additional normative requirement to prohibit the use of DMX512 in these applications. This is not acceptable. 1. Numerous well-established products from multiple manufacturers using DMX512 are Listed as Emergency Lighting Control Devices (ELCD's) to the UL924 Standard for Emergency Lighting and Power Equipment. These products have been evaluated by NRTL's as safe for emergency lighting. Thus, the acceptability and safety of emergency lighting systems using DMX512 has been well-established for many years. Such systems are	Referred to E1.11 TG Accept in part

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			accepted by mainstream codes and standards such as NFPA 70 and UL924, and will remain so for the forseeable future. 2. There is no prohibition on use of DMX512 in ELCD's by NEC article 700, which covers emergency lighting equipment. 3. There is a long history of good performance of ELCD's using DMX512. There is no record of loss or failure to suggest that prohibition of DMX512 in ELCD's is warranted. 4. There are Directly Controlled Emergency Luminaires that use DMX512 that are Listed to UL924. There is no record of loss or failure to suggest that prohibition of DMX512 in Directly Controlled Emergency Luminaires is warranted. 5. Clauses of the NEC and the NFPA Life Safety Code prohibit emergency system designs that might place into darkness any space that requires emergency lighting due to a failure of an emergency luminaire or ELCO. Practically speaking, these clauses require equipment redundancy to ensure a minimum level of system reliability. It is for this reason that previous proposals to build more reliability into UL924-listed equipment were specifically rejected by the Standards Technical Panel for UL924. The prohibition of DMX512 in emergency lighting applications would represent an attempt to make emergency equipment "more reliable" without a valid rationale or record of loss or failure citation to justify such an action. 6. While Emergency Lighting is a well-defined term, Safety Lighting and Security Lighting are not. They should be removed as noted below. Please remove Safety, Security and Emergency Lighting from section 5.6.2, and the Safety, Security, and Emergency lines from Table 2 Hazards. Note that this commenter is a member of UL Standards Technical Panel 924, NEC Code Panel 15, and NEC Code Panel 13 that covers article 700 Emergency Systems	
2	BG	5.2.12	**5.2.12 RDM Bias Resistors** The required RDM line bias circuit provides appropriate bias voltages on the line, so voltages required in Section 6 are met for 5 volt and 3.3 volt systems. Values in RDM are examples for 5V and should not be used for other voltages.	Accept in Principle Add the following: A properly designed RDM controller has biasing and line termination built in; hence if

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			A properly designed RDM controller has biasing and line termination built in; hence if an RDM controller is placed at the end of a transmission line which is configured for DMX512, the controller will transparently deal with the necessary bias and termination. It is recommended that a tester verify that biasing and line termination are correctly implemented.	an RDM controller is placed at the end of a data link which is configured for DMX512, the controller will transparently deal with the necessary bias and termination. It is recommended that the user verify that biasing and line termination are correctly implemented.
3	BG	5.5.1	5.5.1 Grounding Topology We should point out that DMX512 states that it is preferred that there be one DIRECT connection between shield and earth ground. There may be multiple RF bypass capacitances. The value is not called out in DMX512.	Accept in principle Add the following to 5.5.1 after the second sentence: E1.11 Section 5 states that in the preferred topology that there be one and only one direct connection between Data Link Common and earth ground. There may be multiple RF bypass capacitances based on manufacturer implementation. Insert CR before “Most twisted pair cables...”
4	BG	6.1.3.1	missing label	Comment withdrawn by the commenter
5	BG	6.1.3.6.3	~~**6.1.3.6.3 Auto-addressing Devices**~~ ~~Some devices use a receive-and-retransmit strategy to allow devices to be physically placed in any order and behave as though they are addressed sequentially. Typically each device will receive a packet from the previous device in line, process the first set of slots itself, and transmit the remaining slots to the next device in line as a new packet without the slots the device itself has processed. When testing strings of devices that use this technique the slot data should be adjusted for the slot footprint of the device, and the data pattern used shall be reported in the test report.~~**(This is not part of the standard. Failing does not make the DUT non-compliant. If supported, it is a section 5 item. Move or delete.**)	~~Accept in principle – reword to apply to general in-line processing devices~~
6	BG	6.2.1.2.6	**6.2.1.2.6 Hazardous Applications** No device using DMX512 data intended for hazardous application(s) may be deemed compliant or conformant under this standard. If the product documentation lists any of the following applications, or shows the device being used in any other potentially hazardous manner, it shall fail the test. An exception to this statement shall be if the specialized lighting	Accept

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			usage is accepted by other nationally recognized codes/standards. Is this a correct statement? Moving Scenery, Moving Rigging and Pyrotechnics cannot be considered compliant or conformant with this standard.	
7	BG	6.2.3	If necessary test points are not available, the tester shall report unable to test ~~failure of that test on the test .~~	Accept
8	BG	6.1.4	~~**6.1.4 Test Procedures**~~ 6.1.4 Combining MultipleTests Tests may be combined at the tester's discretion only if the test equipment is capable of separately verifying the results of each test. Reason: This is an important concession which should stand out in the table of contents.	Accept
9	BG	6.2.2.1	Portable devices with 5-Pin XLR plugs for inputs and 5-socket XLR receptacles for outputs are compliant. What is classed as a plug and what is a receptacle is open to misreading. A common misuse of the terms is that a cord mounted connector is a plug, while a panel mounted connector is a receptacle	Accept in principle – reword as follows: Portable devices with XLR connectors having 5 contacts, aside from the shell, are compliant for DMX512 with pin contacts (inputs) and socket contacts (outputs) per E1.11 Clause 7.1.
10	BG	6.2.2.2	New 6.2.2.2 Water Resistant Connectors Water resistant connectors may be considered conformant if other requirements for XLR style connectors are followed.	Reject see E1.68 Clause 6.2.2.3 for harsh environment connector requirements.
11	BG	6.2.3.1	**6.2.3.1 Receiver Preferred Topology Test** **Test 1 OK** **Test 2 Impossible** There is no possible reason for this test to require 42V bias other than an error in drafting the original standard. If the standard is read as requiring maintaining 42volts during the test, then the minimum current required would be 400 mA . It would increase to infinity as the resistance approached zero. We would be dividing by zero. We could apply an OPEN circuit of 42 volts. Even if we allow just 400mA the resistance would dissipate 400mA* 42V = 20 watts, enough to burn out the resistance. We should just allow the use of an ohm meter and get on with it. We will need to open E1.11 anyway. **Test 3 OK** **Test 4 Do not attempt if test 3 fails** **Test 5 Do not attempt if test 3 fails** **Test 6 Do test only if 2nd data line installed** **Test 7 Do test only if 2nd data line installed**	Accept in Part Recommend E1.11 delete 42V requirement. Revise Test 2 Conditions: Remove “42 Volts” Add “Only if (A) is implemented” Reject Test 4 and 5 Accept in Principle Test 6 and 7: Adjusted supporting text to include 6 and 7

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			Test 8 non-isolated common is not called out in the drawing **I believe we mean the point labeled 0V on the block labeled 9.** **Test 9 thru Test 15 This is a dynamic test in a list of static tests. Static data does not have a loss of data state. What are the packet details? Fix or remove.** **figure 2 + figure 3** **Figure 2 is an excellent drawing explaining the dynamic voltage ranges of 485. However more text is needed.** **Figure 3 is a schematic of a circuit to stress a receiver's ability to tolerate common mode voltages. While simplified, it is still too complicated for use here.** **Figure 2 needs more complete labeling and more explanatory text.**	Reject Test 9 thru 15, tests are voltage tests not data content tests Accept in Principle Table 2, added explanatory language Accept Table 3, deleted
12	BG	6.2.4.2	**6.2.4.2 Transmitter Non-Preferred Topology Tests 6.2.3.2.1 Non-Isolated Receivers** **None of the tests in this section require test voltages higher than used by a high quality Vohm meter.** Non-Isolated receivers as described in Annex A2 of DMX512 shall pass all applicable tests of 6.2.3.1, with the Pass and Fail Values for Tests 2 and 3 of table 3, modified to a nominal 100 ohms. E1.11 specifies a tolerance for the 100 ohm resistor of +/- 20%. The wattage of the resistor is specified in DMX512 as being able to safely dissipate 2 W, which shall be confirmed by either visual inspection of the device or confirmation on the device's bill of materials. In the case of multiple non-isolated receiver ports, the total parallel resistance shall be 100 ohms, and the resistor wattage shall sum to 2 W or greater.	Reject – No suggested change to text, and note is consistent with existing text.
13	BG	6.3.1.1	**6.3.1.1 START Code** Test equipment requirements: Transmitter capable of sending different START Codes Test conditions: Break: 92 microseconds MAB: 12 microseconds MBB: 0 microseconds Inter-slot Mark: 0 microseconds START Code: 00h NSC Slot data: Alternating 55h and AAh from data slot 1 to data slot 512 ASC Slot data: Tested ASC - Properly formatted alternate packet	Reject: 1) Start Code F0h through F7h are reserved for development and it is reasonable to test products sent for compliance with these Start Codes. 2) ASCs are fully documented in E1.11 so a tester can determine expected output from a receiver that implements one or more ASCs based on the product documentation. Products that do not implement any ASCs do not have to

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			data. Intent: The intent of these tests is to establish that the receiving conformant DUT filters ASC packets. The DUT shall do one of the following behaviors: * Filter out and discard the ASC packets other than those listed in the user documentation. No change shall be made to the DUT's Null START Code Slot data. * Use the data in the ASC packet to control some functions of the DUT. No change shall be made to the DUT's Null START Code slot data. * Use non-standard decoding of the ASC data as an additional data stream. Examples are ASCII or 55hex * Use the data in a completely different protocol (RDM) START code handling: * Note what START Codes are listed as supported in user/technical support documentation. START Codes not listed shall be tested as unsupported. * Test the receiver at the START Codes listed as required tests in table 5 and ensure the specified Pass Result occurs. Procedure: * Send a NULL START code packet with packet data chosen to be clearly observable. Send a second packet with an alternate non-NULL START code. The output of the fixture should not	do any ASC tests.

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			change unless the packet is specifically designed to make such a change. An example is the 55h packet. ~~*Any procedure that sends a recognizable result using a NULL START code packet which can then be triggered to send an additional packet which varies detectably from containing a recognized~~ * RDM compliance is beyond the scope of this standard. If the DUT is not an RDM responder, the DUT should properly ignore any RDM packet sent to it. If the DUT is an RDM responder, there is a finite possibility that the RDM responder shall change state when receiving a packet with a Cch START Code. ~~Table 5: Required START code tests~~ ~~Delete Table 5 as there is nothing particularly unique about START Codes F0 thru 7.~~ Tester shall test as many START Codes that are not supported by the DUT as is practical. Tests using an unsupported START Code shall not cause the DUT to change its output state. table 6: Recommended START codes to test The expected results for the Alternate START codes are not obvious, even to one well-versed in the standard. The two START Codes used for text can be used to transfer any short text message to a (DUT)responder. How the responder uses this text, particularly in DMX512, may be invisible to the tester without considerable knowledge. 55hex is a special case meant for bandwidth calculations. We need to find a recommended packet to allow us to detect an expected result for SIPs. I do not have a great answer to what other results should be expected for these START Codes other than that they should not cause blinks. The problem is primarily caused by the fact that DMX is a read-only protocol, and most ASCs are specifically not meant to be visible other than for their intended use. START Code 91 is very seldom used. Any device using it will	

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			need a full definition of how it works in the DUT's documentation. 91h followed by a 2 byte Manufacturer ID field is reserved for Manufacturer/Organization specific use. The transmitted byte order is MSB, LSB. The next byte after the Manufacturers ID would normally be a manufacturer's sub-code.	
14	BG	6.3.1.2	**6.3.1.2 Stop Bit Reception & Framing Errors** **This should be cast as a framing error . Any good receiver will fail a dropped stop bit.** **The test should show whether the DUT drops the rest of the packet until it sees a new Mark After Break sequence.** From DMX512 – Rejection of Improperly framed slots A receiver shall check the first stop bit and should check the second stop bit of all received slots to determine if they have the correct value. If a missing stop bit is detected, the receiver shall discard the improperly framed slot data and all following slots in the packet. Test equipment requirements: Transmitter capable of sending frames with 1 or 2 stop bits Test conditions: Break: 92 microseconds MAB: 12 microseconds MBB: 0 microseconds Inter-slot Mark: 0 microseconds START Code:00h Slot data: NSC that produces an easily observed pattern ~~NSC - Alternating 55h and AAh from data slot 1 to data slot 512~~ Procedure: Start by sending a properly framed NSC packet, the expected packet. On command, send a burst of packets lasting a few seconds, each packet having the same slot missing the 2nd stop bit . If the expected output remains constant, the packet with the framing error has been rejected. The DUT passes this test. If the expected output changes, the DUT has not rejected the framing error. The DUT has failed this test. ~~A) Set Transmitter to send 2 stop bits. Verify receiver has the expected output.~~ ~~B) Change Transmitter to send 1 stop bit. Verify receiver enters data loss behavior~~	Reject – Stop bit reception is different from a framing error, the existing test does test for differences between 1 and 2 stop bits.

<table>
<tr><th>#</th><th>Commenter</th><th>Relevant clause</th><th>Comment</th><th>Proposed Resolution</th></tr>
<tr><td></td><td></td><td></td><td>The standard does not speak to loss of data from framing errors

6.3.1.2 Stop Bit Reception
Transmitters in DMX512 do not receive!</td><td></td></tr>
<tr><td>15</td><td>BG</td><td>6.4.1.1</td><td>6.4.1.1 Receiver Break Length
Table 8: Receiver port timing tests
<table><tr><th>Break</th><th>Unit</th><th>Result</th></tr><tr><td>86 <u>and less</u></td><td>Microsecond</td><td><s>Expected output</s>
<u>May Cause Data Loss</u>
Conflict needs to be resolved</td></tr></table>
Line 1 of table 8 shows that a receiver may require a break to be at least 88 us. This test does not require
breaks of less than 86μs to be failed. We will find that there will be strong pushback against this requirement.
While there is no dispute that a transmitter can be required to produce a Break of 92 microseconds, and a receiver should accept Breaks greater than 88 microseconds, there is no logical reason to require receivers to reject any Break shorter than 88 microseconds. This requirement alone will cause significant numbers of DMX receivers to fail the compliance tests, and will require DMX receivers to waste significant time and require an additional timer in their output routines.

6.4.1.1 Receiver Break Length
However we need to define ‘Single Slot data’</td><td>Referred to E1.11 TG

Accept in principle, language adjusted to match new E1.11 language.</td></tr>
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