

RS-FEC Codeword Examples

IEEE P802.3bs 400Gb/s Ethernet Task Force

John Dillard, Microsemi

Background

- P802.3bs Draft 1.2 refers the reader (pg 102) to Clause 91A for example RS-FEC codewords
 - Clause 91A may be useful as both scrambling/transcoding and encoding example
- However P802.3bs clause 119 differs from clause 91 in multiple ways
 - Clause 119 changes the location of the scrambler function vs clause 91
 - The 257-bit blocks are distributed (interleaved) to two different fec codewords
- These differences make clause 91A not very useful for 802.3bs

Proposal

- Add informative annex to clause 119 that provides example codewords
 - Similar function of clause 91A
 - Provides example output covering path from CDMII (119.2.3) to symbol distribution (119.2.4.7)

Possible content 1

RS-FEC Codeword Examples

This annex provides example RS-FEC codewords produced by the 64B/66B to 256B/257B transcoding, scrambling, Pre-FEC distribution, and Reed-Solomon encoding defined in Clause 119. This annex presents data in a tabular form. The contents of the tables are transmitted to the symbol distribution function from left to right within each row starting from the top row and ending at the bottom row. The tables contain both binary and hexadecimal representations of the data. For the hexadecimal representation, the most significant bit of each hex symbol is transmitted first.

Input to the 64B/66B to 256B/257B transcoder

A constant transmission of Idle control characters is sent to the 256B/257B transcoder resulting in a continuous stream of stream of 257-bit blocks, `tx_xcoded<0:256>`, shown in hex:

```
tx_xcoded<0:256> = 00700000000000000780000000000000780000000000000780000000000000
```

After scrambling, distributing into two message blocks, and RS-FEC encoding, codewords c_A and c_B are produced. c_A and c_B may be illustrated as two 5440-bit representations cx_A and cx_B as follows:

For all $i=0$ to 543:

$$cx_A \langle (10i+9):(10i) \rangle = c_A \langle i \rangle$$

$$cx_B \langle (10i+9):(10i) \rangle = c_B \langle i \rangle$$

The expanded codewords are shown in table 1 and table 2. Immediately before the `tx_scrambled` sequence resulting in c_A and c_B , the `tx_scrambled` value in hex was:

```
tx_scrambled<0:256> = 158db3136183df63422fc366a6738756413c3ea73063aded06ef6e97c2e6a59c9
```

Possible content 2

Index <i:j>	$cx_A<i:j>$
<5439:5120>	989dd562b6b6e0d702b098e28a748cb13d99065dabbbe702f443e0a8eb4627e2d6653111ef11bd69
<5119:4800>	5efafb9d892617dcb98b2107a0c31802a6430d3b3f2a14d26b8c878e2fb4f6f3c8d360b76f96cbc
<4799:4480>	3dbc8151d9360f94684aacf631331d3f89dee071fef638715215b221ef8cbe5df26e51cd60602ac
<4479:4160>	e633659d7ddfbe7b813062520ad3f2849947d64ee7f5ad704a1ecf20bd604adbbed797ad1a66fe7e
<4159:3840>	6da50d11454db73b2afb7cf04949feba06be2e8ff7c65131c50fdb18a5171e381fe61ee72b1327
<3839:3520>	3f822ad82e943ba88ec97fdecf3689274b7fb07cb6fc51c854ee236b2705ba630ad5a27597ce0fcb
<3519:3200>	67a0b8f76220a3e265df70cc925b149e5affe049a5fd9d6749d9972584a03b20897a3f6b6885642f
<3199:2880>	43a46a3260abc93f3ce2f0d82f6431232ee1295427ab7c6a7c083f8a3ef46e4d99840201a9900a4d
<2879:2560>	a9ce6301dae67dd2e808ea92a35d7f4848a3df0d565c3dbcb751f80a389169febfdc9bc05b0aa518
<2559:2240>	0e2d6d6865c63e4e55340cc7f552326d74c121cbfdd17e2576a06590758ca62c1cbec509da927add
<2239:1920>	c9449096ed8017f2ef3f409b113b9fd2ddc5083c35b4e1929238750751908fbbd1eeb13484649417
<1919:1600>	a0c42d12816cb919e6a4711cc52fab35987104f61056b477a5f539640e3e58c5f0fa0fc2208e1ec6
<1599:1280>	50582046915a34c443fc150ba757b8711a9033a5db0d1d7fb366c0f48761237f8a7adf6c5c89bd88
<1279:960>	d155ff017eadd4cc100bd46c42ab36b93bleff61ccd5f104639dc51c8fb5dd71295c54bbebfd8be4
<959:640>	8782a3e0929d86907da9fd5d3241140f2aed6e5981afae59fcdd627b15ce4ad5679ae129909facad
<639:320>	edfacfde3b44098c1a08a97c53404be6411778ee3af00107baf83cdc7a1e1f1c8ee4fbabb939a463
<319:300>	f40ab
<299:0> (parity)	1e759da723a526771c284c21906997cb6fa749bcd2869be5406e4b753c179bade4ee047d32f

Possible content 3

Index <i:j>	$cx_B<i:j>$
<5439:5120>	164402fd3613cb45954927e0dc772103557b3ba88c867fcebe783a3d07a9d210413b50d9abb19e84
<5119:4800>	6765b5bc494857f409f7b7b3bc482a11dd10a6f998076a38d3968ca3a7f391bc3b7c70a7c8f94de0
<4799:4480>	81064de8ade91888652ddba103f2d3be85772595bcbb88715cb8329f9d2c8e66f15eb9ec2499d9c8
<4479:4160>	6b8792942f5313e2b7cc067cd7fde00328f9fb4424d3de60ba60cbb7bc3df666538cc4fa35b71557
<4159:3840>	bd2dacbe10c84c3453a92e891edf667fc6689a4c9c9afaabcbcf84fdb5e86952fabdfe8705b9c6aa
<3839:3520>	f7ac9d1493c42986b1885c3aff6f8b81a2db869706ff36a0ff8a0154ac80e430a3af616dfb680fb6
<3519:3200>	3b25b26c1676e2dba160bfd0a0813a9499599f5e15a367f20edcc78ce8e020cbe2647f18cf94ba64
<3199:2880>	6a679937566e338424eed2835a88c89720c473918358f78b44a45da6664eeeb418da4e32c2a3d927
<2879:2560>	1c7aedc7cb54d39d6dc7f8c35dc0e22d5ad588fb76b25f4ce408586ca4d57d7a073cad43d256b2d1
<2559:2240>	67d031eee61f86d219a9562f591a2c67987510a4b0d03121314508af1bf030509673b4632bd4ac3d
<2239:1920>	0eb5ac4aa390495e203a387ff9f8c7701fcf408ee5cb0fa2bd791a45776b31de22e7c0490ce9882e
<1919:1600>	8098882a44c7ca047b9769d8c0daaf5e25a05c7367433f497e3954b0b69cd11450177314eb83d348
<1599:1280>	f50590e0d93296214c831c455060364641dae548d6d72fff6fc8c48129eccdfe438138225a4416f0
<1279:960>	fafc99261eb599dbb07bc4586258068aa26c2a990336e680b4c2d322a35b4628756906c32d53eea9
<959:640>	b216af3a076f7f017e9774e5cd325d4c5fdc3cb23e29a94373e3b2d86c75318bcdfa8f6409862f28
<639:320>	78cf6cee03282cf3414fb1e938c0c4ef1ee4bd18bb0c78c2d80a7e3a88fbebada57a7f9d0686b7893
<319:300>	b3bfe
<299:0> (parity)	e353fd1569e00b6680a2f8247761a6ebbfdbf283be8394869f3bd2ee7524caa9bf6800b7d90