

RS-FEC Codeword Examples Updates

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

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Background

- Clause 119A was added to P802.3bs draft 1.3 with RS-FEC codeword examples
 - Clause 91A no longer applies to 3bs due to codeword interleaving, changed order of scrambling, etc
- There was an error in the parity calculation in draft 1.3
 - Comments #4, #17
- Additional clarification on the whole process from CGMII to codeword generation is possible
 - Alignment marker insertion
 - Comment #2

Suggested updates

- Update clause 119A example:
 - Include the generation of `tx_scrambled_i`, `am_mapped`, `tx_scrambled_am`
 - Include newly proposed alignment markers (per `anslow_03_0416_logic`)
 - Correct parity calculation

Proposed content 1

RS-FEC Codeword Examples

This annex provides example RS-FEC codewords produced by the 64B/66B to 256B/257B transcoding, scrambling, **alignment marker insertion**, 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 hexadecimal representations of the data and 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 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> = 007000000000000000780000000000000078000000000000007800000000000000

In this example, an alignment marker is due for insertion. After scrambling and inserting the alignment marker group am_mapped, the variable tx_scrambled_am is produced as shown in table 119A-1. Just prior to insertion, the seed of the PRBS9 generator used for padding was

P<0:8> = 0x100

After 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 **119A-2** and table **119A-3**. Immediately before the tx_scrambled sequence resulting in c_A and c_B , the scrambler seed (see 49.2.6) was:

S<0:57> = 24e6959d0fa5dbd

Proposed content 2

am_mapped[2055:0]

tx_scrambled_0..tx_scrambled_31

am_mapped[2055:1920] == prbs9 pad

<i:j>	tx_scrambled_am<i:j>
<0:256>	0b2acab2acab2acab2acab2acab2acab2acab2aca9324c9324c9324c9324c9324
<257:513>	192649926499264991b421184592144d2f445014d517435064290242ca669aa6a
<514:770>	1374dd314c5354d5354dd314c5334dd356d5b56d5b56d5b56d5b56d5b56d
<771:1027>	0b6adab66f9b96c9b76ddb96d1b76d1bf6e1b26cddb6d9b8b196f7c588549274
<1028:1284>	063530ac615723489c7aa5333d91c8099e79115b747311f9c333ae74adeaefbf9
<1285:1541>	1d7e1aa0bd3d8ba16daab83c86f1c6a4c3d959e99a91de9020db9eb3922fa719f
<1542:1798>	036fa98f2dab3957b8b0999dfdbae1ee2924183bb157354862e1154102985e84a
<1799:2055>	15d1b04967a30d5178ce48f0569849a00846139561bd37228569fb24b7e4d4cc0
<2056:2312>	08ccd177010357e8dab65b6f9160968075341ac958cfc828d8372dc66242646d8
<2313:2569>	026feaa09736e915dd54c5f7e600ecfcb7d7c207941c5d7182d8b95fe412ed12
<2570:2826>	014cce446415f10cdc7bbaafb1cc4b442ef5737afb4f3bed48d240c9095f5fd3a6
<2827:3083>	10219fbel35ede0b73c15238c150007886562e30a50cb27df341954db8calc564
<3084:3340>	16598ead3c229838cb9bee7f793139ee1f89fdad9071687cbef89b4e527a03cd
<3341:3597>	1c2044f260a85ee6eb506c25e7c1196298548b4b3576f1b084c83f2e3cb5fc5f6
<3598:3854>	1c9d40ef27471536fe9eb5e3bc3870d46755080ea6d29f09cf8fa697a738dd3ec
<3855:4111>	193fa8a7675ce03706a49019b93544e19dd66ce78e6a94bebd07eccae7df2076d
<4112:4368>	081919f234c00959e5affc9f83c909805378b5f3f2e4917f3e48b5de4758cea42
<4369:4625>	1d378c193cdd3d0f781abc3529bf76a66b7c73a7230b517d96daff6a39f9ea9b6
<4626:4882>	05e852b6917e9d1410b6509e778629a516fb2bceaba79f12241dbc94cdaffff02
<4883:5139>	1d98f5991744c9fc5393efd6299558cb4f28df3bf3c8636dba505e3a296c7bd2e
<5140:5396>	00faacfbfdbc1c29ced046c73c9aaafe3de8849adad16e864814846bb8cb889ad
<5397:5653>	04d11bfe0e8def5ecfdba45dlee4607b4b44df874f8e976dd828fcfd38158a8ff
<5654:5910>	00ee28b635049ba9506024ba13862a1d6bae22d0db5ddb1f4dbe0f80e9edbbcc6
<5911:6167>	1cd0769bc76446da04136e7c6d19905dfb81ac3bfd931426901028d729e529f5a
<6168:6424>	14c3ff33243d7d2b5137b63359fd25b82cde769d0f10d2e60a0386e60820be8f4
<6425:6681>	1993f1fe2d6c60459f26a74bd0265c2959899e4c5b24196afd51db241cfcf9091
<6682:6938>	18ee61ea5a0d584de8ac602618874bba60a907115513bc960f6be32c68f1f2458
<6939:7195>	042251fd6ef16662f5c99d9779b20b865b1401c96034c99550401bcb2792e5638
<7196:7452>	0ce3ae06476b769f33e5577ce4ba6d62071cabe3ea9561d6077fd23909568a25a
<7453:7709>	1bbc46ac3df26a5bb0ea4fdbcfb42738a84007619c594e24ab396afb5f05fbff
<7710:7966>	076c96a407e106d494aa6b0c5168e1f335b812d7bc530ce8c6fc13f6c54ec2165
<7967:8223>	056cc06afe2bd2a9894c4d1ad9e632f861208ad3894eff0de8b0291c486ea3281
<8224:8480>	094534a897031e6307e32c1906c85e99cd4696fc818d2b5eaf26a576de149ae12
<8481:8737>	085ae9048eddc5401827faa937411ff35c10287236ffdc87e7e7e334b038ee3f9
<8738:8994>	014179e0e2359d3b961a1302fa4b7ac384f0564b15d7504dadbe3c65ee8f6f13a
<8995:9251>	08d40f4b092621cca4919e81d0c15014204622d41814894dbe389c149e5e2257a
<9252:9508>	0e4772c6718da5361abfaad60f5c32d304740de671045cdad6617125f4bbf457d
<9509:9765>	071a7d2b02b41f13971a22fe8a29f0a03c1cec43ca0411d7872f18d12e0a2bd06
<9766:10022>	1344403844b360b4a61968d045941ff821511c2e95455c300eed811d314ad7018
<10023:10279>	0275a5c4a36f6b8b13afafffcdfdbd9b13f00488494886cdeb13b31fc9f7941cf

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Index <i:j>	$cx_A<i:j>$
<5439:5120>	a6a9aa6a9aa6a9aa6a9a64992649926499264992d886284bd280ba2609026519565d946559565196
<5119:4800>	6d5b56d5b56d5b56d5b57d936ed8b62d876cd9b6077efa842e86550894abde6024f1dbc4598972ea
<4799:4480>	bcd56bc9a11d7d8256a659a5edb273e5f63e326a3bccbb63b3054625443810bd2ea92c331e3c619
<4479:4160>	401c8f61447e7edcca66077d56afed4815c9afe6d8b691236c7f7a4894aa7ecdcebc10380639d209
<4159:3840>	48b9904d84bbdc645b57bebee96049f5cb27e7acb40a8a0de01aa509342c6cb8534aaea22633bd93
<3839:3520>	3bfff204fc2fd8e502d0f4f285d750d83e51d13ab0db043c68f7267b51cbf8f70ecc40896dc8cbe72
<3519:3200>	f95fc9b807959988abb99cd56f5f37efb6ec4e58d4beb0ff21f679f490f9dd635a10c7b3fc2d5a52
<3199:2880>	56cfb4e62bb695b79d1ba97f4050533dd2c9beab1f1c1653ff6e99ac88a3fde99b4fb1f3f6c82945
<2879:2560>	f7be0efb07b9c6cacb8f9096b308258ef228b01ff7afcba189d2c7e71eed3f207f163b58eec0c02e
<2559:2240>	a8eeb169dd65cf86f319b82e36dac8d8e09077dca3009ac4a7569ffe11a96f735ed0f685e96028ce
<2239:1920>	e8265f8cda9a39540a509936869a2a8267ce3abc560bd80f08cbb0415749facb149c42afe68ebe9b
<1919:1600>	135a6e02c0aa5807906ae384cb74f99f6cb700fa5480d25d52d208fbc295570f642c546e2685255a
<1599:1280>	0fbffd27f056f2a147c33b6f561bb1df9b994e0351d95c8f9b7d104470ff3463815d28a958106069
<1279:960>	9b3324b302d6ac9db6b2a10823b86055e0bacc50f6f847e434c7414e0dcd0d206da50e4d75db65e3
<959:640>	2ee470ad0de1092e04a8812b44a3db0e7a77a9dcc7194fea0da61c433f4435891ee97dbe750c8d16
<639:320>	51543380f0881388b114962019a6962d0d13fc4552e1d6ee5cd6a408eaf6237f5fec980292cd9c8
<319:0>	4fc29e524ac56d33248be7cbb1eba5f71f5d872e35e9afa1b54db4d1a4fc09e8057f65fbc3e55fd5

Proposed content 4

Index <i:j>	cx _B <i:j>
<5439:5120>	a6a9aa6a9aa6a9aa6a9a64992649926499264992109a2c8a22acac250b426599565d946559765197
<5119:4800>	6d5b56d5b56d5b56d5b59dbb69dbb6fd936bd8766986849163c6a27c7265713cc5127173faef6bef
<4799:4480>	1fbd07455b4f238f0d79e24405e744e62beda55386bf7c3892ee19da30550caa40d9798a89c6a164
<4479:4160>	621aaec9a824ec9203458118bb4f4402c1635209d83314ca401576cee30193ffae9eae9b4feb74
<4159:3840>	940447d476fae46ba3d97965681352e5e1087ded3cc7100984c74c2f3bea631da8335e5832cedfce4
<3839:3520>	3f1add1fe9b232567a2041a7782a7aa62a1348f6c874feb76f8145cb65af1ed61554ae7ca3ef4b63
<3519:3200>	999453ac3b093278719a71f4ae09d404c0a9f0014f09f279005a3a7fd289c4eb9b2c98f2c1eb0efd
<3199:2880>	599ce431befd79c6542f4b572684f2a32d19ebcb2267bad81ff1ba2f93274686a4f37361176c78da
<2879:2560>	749aab7ca1415e7ea8bd6b3b4026b13a65af6317dea7dde1e0c8b2eba5412fd1a83da29055292039
<2559:2240>	5c08e6db1b3eee0eeeced94892079d98bee35a6f6410294fe5866667d64598e5f680b711c33c3a08
<2239:1920>	e2fc9d1e0693fd2e999ac9c24fd4dbfcc90338b490c6ac33a5a8111ee5e0a631e0d229f75199927b
<1919:1600>	1d0a36924c20b4f749870eab79f355a4e35a72be70ff713a8b76b5693cddfc9fd73802e6072736df
<1599:1280>	7eadc1281094a1a8b599a41478b9075190836bd54bca458b19862d4729ec9418414e51d233c8fc4c
<1279:960>	f41597ee58eaf5250e435d7710abe4b27f820c4eeffe7b331c27f3d623b942cbelacle46815edb4c
<959:640>	b784b2f192531e6308a04606029071929114e71ab62c36a9d71958111ed9d0d7d45d8e353823a7f4
<639:320>	e53c08de057ad8f1d0bd114438370c05b05422875160140e51c056bc5075f5cffbdf211044d7a33
<319:0>	efbce079f39fdd0e6bdd2b8ed1cc0790b29c992d54c852ddd29825193c8caee6f675e83eca4495ad