

SMPTE STANDARD



2160-line and 1080-line Source Image and Ancillary Data Mapping for 12G-SDI

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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual.

SMPTE ST 2082-10 was prepared by Technology Committee 32NF.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

This section is entirely informative and does not form an integral part of this Engineering Document.

SMPTE ST 2082-10 defines the mapping of various source images and associated ancillary data into a 12 Gb/s [nominal] SDI bit-serial interface.

The general process for creating 12G-SDI is illustrated below in Figure 1. Detailed definitions of how this process applies to each of the modes defined in the scope follow in other sections of this document.

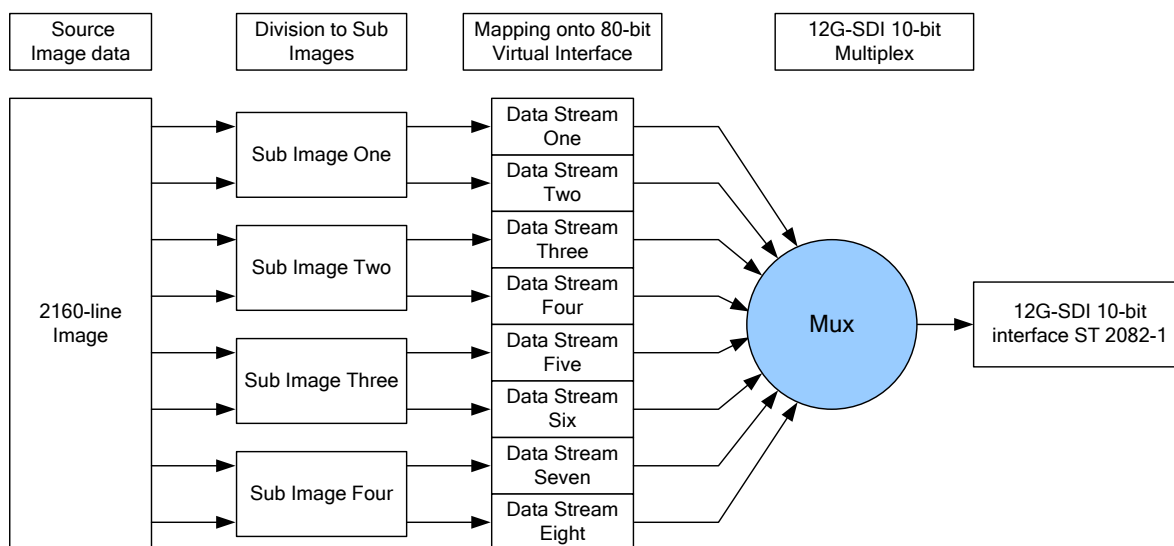


Figure 1 – Carriage of 2160-line images in a 12G-SDI interface – generalized process

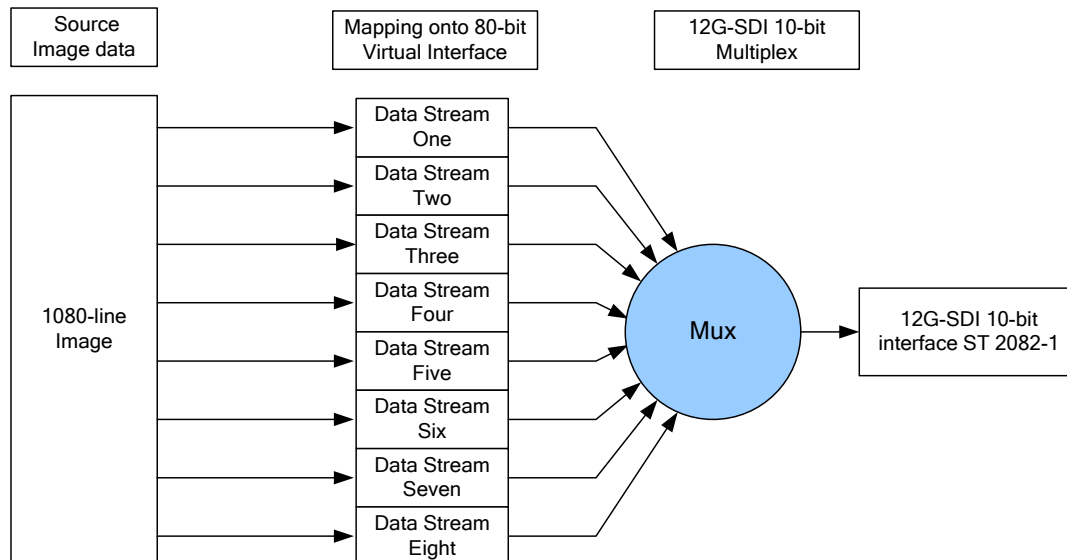


Figure 2 – Carriage of 1080-line images in a 12G-SDI interface – generalized process

Formatting

2160-line source images are divided into four 1080-line sub images.

The 1080-line source image, or the four 1080-line sub images divided from the 2160-line source image, are then mapped onto an 80-bit virtual interface consisting of eight 10-bit data streams. Each 10-bit data stream includes timing and sync words, line numbers, cyclic redundancy codes, ancillary data, including audio, and payload identification packets.

Multiplex

The 80-bit virtual interface is multiplexed onto a 12G-SDI 10-bit interface. The data streams are multiplexed in the order data stream eight, data stream four, data stream six, data stream two, data stream seven, data stream three, data stream five, data stream one...onto the 12G-SDI Link.

1 Scope

This standard defines the mapping of:

- **Mode 1:** 2160-line Standard Dynamic Range (SDR) and High Dynamic Range (HDR) Source image formats and ancillary data into a 12G-SDI 10-bit interface as defined in section 6 Single-link 12G-SDI 10-bit Multiplex
- **Mode 2:** 1080-line High Frame Rate (HFR) Standard Dynamic Range (SDR) and High Dynamic Range (HDR) Source formats and ancillary data into a 12G-SDI 10-bit interface as defined in section 6 Single-link 12G-SDI 10-bit Multiplex

This standard also defines the carriage of the SMPTE ST 352 payload ID's for the 12Gb/s SDI interface.

It is not necessary for implementations to include support for all formats that are included in this standard. Implementers are encouraged to indicate supported formats in commercial publications.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Normative References

The following standards contain provisions that, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE ST 12-3:2016, Time Code for High Frame Rate Signals and Formatting in the Ancillary Data Space

SMPTE ST 291-1:2011, Ancillary Data Packet and Space Formatting

SMPTE ST 299-1:2009, 24-Bit Digital Audio Format for SMPTE 292 Bit-Serial Interface

SMPTE ST 299-2:2010, Extension of the 24-Bit Digital Audio Format to 32 Channels for 3 Gb/s Bit-Serial Interfaces

SMPTE ST 352:2013, Payload Identification Codes for Serial Digital Interfaces

SMPTE ST 425-5:2015, Image Format and Ancillary Data Mapping for the Quad Link 3 Gb/s Serial Interface

SMPTE ST 2036-1:2014, Ultra High Definition Television — Image Parameter Values for Program Production

SMPTE ST 2048-1:2011, 2048 × 1080 and 4096 × 2160 Digital Cinematography Production Image Formats FS/709

Amendment 1:2016 to SMPTE ST 2048-1:2011, 2048 × 1080 and 4096 × 2160 Digital Cinematography Production Image Formats FS/709 — Amendment 1

SMPTE RP 2077:2013, Full Range Image Mapping

Recommendation ITU-R BT.2100-1 (06/2017), Image parameter values for high dynamic range television for use in production and international programme exchange

4 Mode 1: Carriage of 2160-line Source image formats and ancillary data

In the case of 2160-line mapping, the image formats supported shall be as defined in Table 1.

Table 1 – 2160-line Source Image Formats Supported

Reference Standard	Image Format	Signal Format Sampling Structure/pixel Depth	Frame Rate Hz
SMPTE ST 2036-1 Rec. ITU-R BT.2100	3840 × 2160	4:2:2 (Y'C'B'C'R)/10-bit 4:2:2 (IC _{TC} P ^{*4})/10-bit, 4:2:0 (Y'C'B'C'R)/10-bit 4:2:0 (IC _{TC} P ^{*4})/10-bit	50, 60/1.001 and 60 Progressive
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:2:2 (Y'C'B'C'R)/10-bit	48/1.001, 48, 50, 60/1.001 and 60 Progressive
SMPTE ST 2036-1 Rec. ITU-R BT.2100	3840 × 2160	4:4:4 (R'G'B')/10-bit 4:4:4:4 (R'G'B'+A ^{*3})/10-bit	24/1.001, 24, 25, 30/1.001 and 30 Progressive
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:4:4 (R'G'B') ^{*1} , 4:4:4:4 (R'G'B' ^{*1} +A ^{*3})/10-bit	
SMPTE ST 2036-1 Rec. ITU-R BT.2100	3840 × 2160	4:4:4 (Y'C'B'C'R)/10-bit 4:4:4:4 (Y'C'B'C'R+A ^{*3})/10-bit 4:4:4 (IC _{TC} P ^{*4})/10-bit 4:4:4:4 (IC _{TC} P ^{*4} +A ^{*3})/10-bit	
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:4:4 (Y'C'B'C'R) 4:4:4:4 (Y'C'B'C'R+A ^{*3})/10-bit	
SMPTE ST 2036-1 Rec. ITU-R BT.2100	3840 × 2160	4:4:4 (R'G'B')/12-bit	
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:4:4 (R'G'B') ^{*1} /12-bit	
SMPTE ST 2036-1 Rec. ITU-R BT.2100	3840 × 2160	4:4:4 (Y'C'B'C'R)/12-bit 4:4:4 (IC _{TC} P ^{*4})/12-bit	
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:4:4 (Y'C'B'C'R)/12-bit	
SMPTE ST 2036-1 Rec. ITU-R BT.2100	3840 × 2160	4:2:2 (Y'C'B'C'R)/12-bit 4:2:2 (Y'C'B'C'R+A ^{*3})/12-bit 4:2:2 (IC _{TC} P ^{*4})/12-bit 4:2:2 (IC _{TC} P ^{*4} +A ^{*3})/12-bit 4:2:0 (Y'C'B'C'R)/12-bit 4:2:0 (Y'C'B'C'R+A ^{*3})/12-bit 4:2:0 (IC _{TC} P ^{*4})/12-bit 4:2:0 (IC _{TC} P ^{*4} +A ^{*3})/12-bit	
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:2:2 (Y'C'B'C'R)/12-bit	
SMPTE ST 2048-1	4096 × 2160 ^{*2}	4:2:2:4 (Y'C'B'C'R+A ^{*3})/12-bit	

Notes:

- *1 In this image format R'G'B' indicates either R'G'B' or R'_{FS}G'_{FS}B'_{FS}. The suffix FS and an additional Color VANC packet to describe the FS characteristics are defined by SMPTE ST 2048-1.
- *2 This is the maximum pixel array, the active image might not fill the maximum array.
- *3 Definition of the A channel is application-dependent. An auxiliary component signal designated A or Alpha may optionally accompany the R'G'B', R'_{FS}G'_{FS}B'_{FS}, Y'C'_BC'_R or IC_{TCP} video signal. Interfaces containing the auxiliary component are denoted as R'G'B'+A, Y'C'_BC'_R +A and IC_{TCP} + A. In the cases when the A channel is used for non-picture data, the payload is constrained to 8-bit words maximum
- *4 In accordance with Recommendation ITU-R BT.2100, IC_{TCP} sampling is only applied to High Dynamic Range (HDR) progressive image formats.

4.1 Mapping

The source image shall be divided into four sub images in accordance with the 2-sample interleave division method defined in SMPTE ST 425-5 “2160-line image division into four sub images”.

The four resulting sub images shall then be mapped into an 80-bit virtual interface in accordance with the sub image mapping structure numeral 1, 2, 3 or 4 defined in Table 1 - “2160-line Source Image Formats” of SMPTE ST 425-5 and the corresponding mapping rules defined in SMPTE ST 425-1 such that:

Sub image 1 is mapped into data stream one and data stream two.

Sub image 2 is mapped into data stream three and data stream four.

Sub image 3 is mapped into data stream five and data stream six.

Sub image 4 is mapped into data stream seven and data stream eight

This process is illustrated in the Figure “Mapping Overview for 2160-line Source Images” in SMPTE ST 425-5.

The 80-bit virtual interface shall include sync and timing (TRS) words, Cyclic redundancy code (CRC) words, line numbers, HANC and VANC data— except audio – according to SMPTE ST 425-5 “Level A mapping for 2160-line source images”.

Time code, when present, shall be included in the 80-bit virtual interface according to SMPTE ST 425-5 “Level A mapping for 2160-line source images”.

For IC_{TCP} formats the mappings for Y'C'_BC'_R formats shall be used with Y' replaced by I, C'_B replaced by C_T and C'_R replaced by C_P.

Informative Annex A provides information about the amount of HANC and VANC data space available in this operating mode.

4.1.1 Mapping Process (Informative)

Figure 3 illustrates the process for the carriage of SMPTE ST 2036-1 and SMPTE ST 2048-1 2160-line source image formats in a 12G-SDI interface.

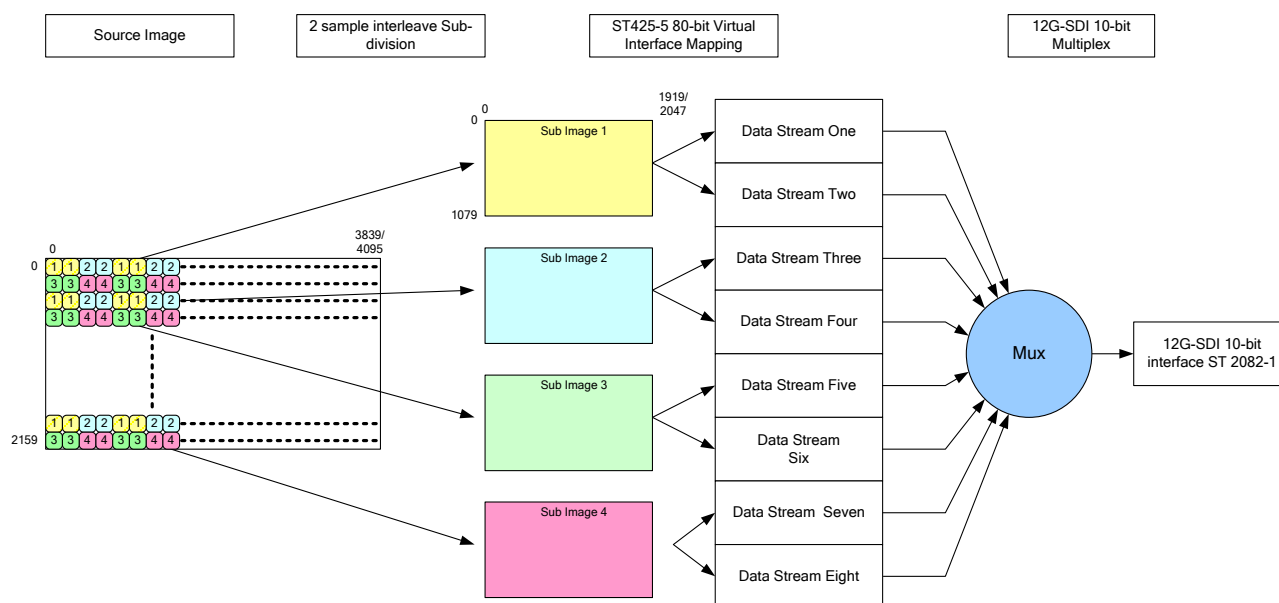


Figure 3 – Carriage of 2160-line mapping source image formats in a 12G-SDI interface

The 2160-line source image is divided into four 1080-line sub images in accordance with the 2 sample interleave sub-division method referenced in SMPTE ST 425-5 2160-line Mapping.

For a 4:2:0 source image, the C_B and C_R samples in sub images 3 and 4 are set to the value 200h for 10-bit systems and 800h for 12-bit systems.

Each 1080-line sub image has the structure as shown in Table 2 – “Sub Image Formats”, of SMPTE ST 425-5 repeated here for convenience in Table 2.

Table 2 – Sub Image Formats (Informative)

Source Image		Sub Image	
Reference SMPTE Standard	Image Format	Reference SMPTE Standard	Image Format
ST 2036-1	3840 × 2160	ST 274	1920 × 1080
ST 2048-1	4096 × 2160	ST 2048-2	2048 × 1080

Each sub image is mapped into two 10-bit data streams.

Sub image 1 is mapped into data streams one and two.

Sub image 2 is mapped into data streams three and four.

Sub image 3 is mapped into data streams five and six.

Sub image 4 is mapped into data streams seven and eight.

Each data stream includes sync and timing (TRS) words, Cyclic redundancy code (CRC) words, line numbers, HANC and VANC data and time code.

The eight 10-bit data streams are combined onto an 80-bit virtual interface:

4.1.2 2160-line 80-bit Virtual Interface Multiplex Structure (Informative)

The video data words from each sub image are conveyed in the following order in the data streams of the 80-bit virtual interface. The mapping rules for each Mapping Structure are defined in SMPTE ST 425-1:

Mapping Structure 1:

Sub image 1 is mapped into data streams one and two:

data stream one: Y'0, Y'1, Y'2, Y'3...

data stream two: C'B0, C'R0, C'B1, C'R1...

Sub image 2 is mapped into data streams three and four:

data stream three: Y'0, Y'1, Y'2, Y'3...

data stream four: C'B0, C'R0, C'B1, C'R1...

Sub image 3 is mapped into data streams five and six:

data stream five: Y'0, Y'1, Y'2, Y'3...

data stream six: C'B0, C'R0, C'B1, C'R1...

Sub image 4 is mapped into data streams seven and eight:

data stream seven: Y'0, Y'1, Y'2, Y'3...

data stream eight: C'B0, C'R0, C'B1, C'R1...

For a 4:2:0 source images, the 10-bit C'B and C'R samples in sub images 3 and 4 are set to the value 200h.

Mapping Structure 2:

Sub image 1 is mapped into data streams one and two:

data stream one: G'0, R'0, G'1, R'1...

data stream two: A0, B'0, A1, B'1...

Sub image 2 is mapped into data streams three and four:

data stream three: G'0, R'0, G'1, R'1...

data stream four: A0, B'0, A1, B'1...

Sub image 3 is mapped into data streams five and six:

data stream five: G'0, R'0, G'1, R'1...

data stream six: A0, B'0, A1, B'1...

Sub image 4 is mapped into data streams seven and eight:

data stream seven: G'0, R'0, G'1, R'1...

data stream eight: A0, B'0, A1, B'1...

Mapping Structure 3:

Bit b9 in every word is the complement of b8. The lists and tables below describe Bits b8 – b0

Sub image 1 is mapped into data streams one and two:

data stream one: R'G'B' 0 [11:9], R'G'B' 0 [5:3], R'G'B' 1 [11:9], R'G'B' 1 [5:3]...

data stream two: R'G'B' 0 [8:6], R'G'B' 0 [2:0], R'G'B' 1 [8:6], R'G'B' 1 [2:0]...

Sub image 2 is mapped into data streams three and four:

data stream three: R'G'B' 0 [11:9], R'G'B' 0 [5:3], R'G'B' 1 [11:9], R'G'B' 1 [5:3]...

data stream four: R'G'B' 0 [8:6], R'G'B' 0 [2:0], R'G'B' 1 [8:6], R'G'B' 1 [2:0]...

Sub image 3 is mapped into data streams five and six:

data stream five: R'G'B' 0 [11:9], R'G'B' 0 [5:3], R'G'B' 1 [11:9], R'G'B' 1 [5:3]...

data stream six: R'G'B' 0 [8:6], R'G'B' 0 [2:0], R'G'B' 1 [8:6], R'G'B' 1 [2:0]...

Sub image 4 is mapped into data streams seven and eight:

data stream seven: R'G'B' 0 [11:9], R'G'B' 0 [5:3], R'G'B' 1 [11:9], R'G'B' 1 [5:3]...

data stream eight: R'G'B' 0 [8:6], R'G'B' 0 [2:0], R'G'B' 1 [8:6], R'G'B' 1 [2:0]...

For Y'C_BC_R formats, G' is replaced with Y', B' with C_B and R' with C_R.

For IC_TC_P formats, G' is replaced with I, B' with C_T and R' with C_P.

Mapping Structure 4:

Bit b₉ in every word is the complement of b₈. The lists and tables below describe Bits b₈ – b₀

Sub image 1 is mapped into data streams one and two:

data stream one:	Bits b ₈ – b ₆ :	A0 [11:9],	A0 [5:3],	A1 [11:9],	A1 [5:3]...
	Bits b ₅ – b ₀ :	Y'0 [11:6],	Y'0 [5:0],	Y'1 [11:6],	Y'1 [5:0]...

data stream two:	Bits b ₈ – b ₆ :	A0 [8:6],	A0 [2:0],	A1 [8:6],	A1 [2:0]...
	Bits b ₅ – b ₀ :	C' _B 0 [11:6],	C' _B 0 [5:0],	C' _R 0 [11:6],	C' _R 0 [5:0]...

Sub image 2 is mapped into data streams three and four:

data stream three:	Bits b ₈ – b ₆ :	A0 [11:9],	A0 [5:3],	A1 [11:9],	A1 [5:3]...
	Bits b ₅ – b ₀ :	Y'0 [11:6],	Y'0 [5:0],	Y'1 [11:6],	Y'1 [5:0]...

data stream four:	Bits b ₈ – b ₆ :	A0 [8:6],	A0 [2:0],	A1 [8:6],	A1 [2:0]...
	Bits b ₅ – b ₀ :	C' _B 0 [11:6],	C' _B 0 [5:0],	C' _R 0 [11:6],	C' _R 0 [5:0]...

Sub image 3 is mapped into data streams five and six:

data stream five:	Bits b ₈ – b ₆ :	A0 [11:9],	A0 [5:3],	A1 [11:9],	A1 [5:3]...
	Bits b ₅ – b ₀ :	Y'0 [11:6],	Y'0 [5:0],	Y'1 [11:6],	Y'1 [5:0]...

data stream six:	Bits b ₈ – b ₆ :	A0 [8:6],	A0 [2:0],	A1 [8:6],	A1 [2:0]...
	Bits b ₅ – b ₀ :	C' _B 0 [11:6],	C' _B 0 [5:0],	C' _R 0 [11:6],	C' _R 0 [5:0]...

Sub image 4 is mapped into data streams seven and eight:

data stream seven:	Bits b ₈ – b ₆ :	A0 [11:9],	A0 [5:3],	A1 [11:9],	A1 [5:3]...
	Bits b ₅ – b ₀ :	Y'0 [11:6],	Y'0 [5:0],	Y'1 [11:6],	Y'1 [5:0]...

data stream eight: Bits b8 – b6: A0 [8:6], A0 [2:0], A1 [8:6], A1 [2:0]...
 Bits b5 – b0: C'B0 [11:6], C'B0 [5:0], C'R0 [11:6], C'R0 [5:0]...

For a 4:2:0 source image, the 12-bit C'B and C'R samples in sub images 3 and 4 are set to the value 800h.

For IC_TCP formats, Y' is replaced with I, C'B with C_T and C'R with C_P.

4.1.3 12G-SDI Link Multiplex Structure (Informative)

Following multiplexing onto a 12G-SDI 10-bit interface according to Section 6 the 12G-SDI data stream is conveyed in the following order:

{n} indicates the sub image number

Mapping Structure 1:

{4} C'B0, {2} C'B0, {3} C'B0, {1} C'B0, {4} Y'0, {2} Y'0, {3} Y'0, {1} Y'0, {4} C'R0, {2} C'R0, {3} C'R0,
 {1} C'R0, {4} Y'1, {2} Y'1, {3} Y'1, {1} Y'1, {4} C'B1, {2} C'B1, {3} C'B1, {1} C'B1, {4} Y'2, {2} Y'2, {3} Y'2,
 {1} Y'2, {4} C'R1, {2} C'R1, {3} C'R1, {1} C'R1, {4} Y'3, {2} Y'3, {3} Y'3, {1} Y'3....

Mapping Structure 2, R'G'B'+A example:

{4} A0, {2} A0, {3} A0, {1} A0, {4} G'0, {2} G'0, {3} G'0, {1} G'0, {4} B'0, {2} B'0, {3} B'0, {1} B'0, {4} R'0,
 {2} R'0, {3} R'0, {1} R'0, {4} A1, {2} A1, {3} A1, {1} A1, {4} G'1, {2} G'1, {3} G'1, {1} G'1, {4} B'1, {2} B'1,
 {3} B'1, {1} B'1, {4} R'1, {2} R'1, {3} R'1, {1} R'1....

Mapping Structure 3, R'G'B' example:

{4} R'G'B'0 [8:6], {2} R'G'B'0 [8:6], {3} R'G'B'0 [8:6], {1} R'G'B'0 [8:6], {4} R'G'B'0 [11:9],
 {2} R'G'B'0 [11:9], {3} R'G'B'0 [11:9], {1} R'G'B'0 [11:9], {4} R'G'B'0 [2:0], {2} R'G'B'0 [2:0],
 {3} R'G'B'0 [2:0], {1} R'G'B'0 [2:0], {4} R'G'B'0 [5:3], {2} R'G'B'0 [5:3], {3} R'G'B'0 [5:3],
 {1} R'G'B'0 [5:3], {4} R'G'B'1 [8:6], {2} R'G'B'1 [8:6], {3} R'G'B'1 [8:6], {1} R'G'B'1 [8:6]...

Mapping Structure 4, 4:2:2:4 Y'C'B'C'R+A example

Word	Word 0	Word 1	Word 2	Word 3	Word 4
Bits b8-b6	{4}A0 [8:6]	{2}A0 [8:6]	{3}A0 [8:6]	{1}A0 [8:6]	{4}A0 [11:9]
Bits b5-b0	{4}C'B0 [11:6]	{2}C'B0 [11:6]	{3}C'B0 [11:6]	{1}C'B0 [11:6]	{4}Y'0 [11:6]

Word 5	Word 6	Word 7	Word 8	Word 9	Word 10
{2}A0 [11:9]	{3}A0 [11:9]	{1}A0 [11:9]	{4}A0 [2:0]	{2}A0 [2:0]	{3}A0 [2:0]
{2}Y'0 [11:6]	{3}Y'0 [11:6]	{1}Y'0 [11:6]	{4}C'B0 [5:0]	{2}C'B0 [5:0]	{3}C'B0 [5:0]

Word 11	Word 12	Word 13	Word 14	Word 15	Word 16
{1}A0 [2:0]	{4}A0 [5:3]	{2}A0 [5:3]	{3}A0 [5:3]	{1}A0 [5:3]	{4}A1 [8:6]
{1}C _B 0 [5:0]	{4}Y ₀ [5:0]	{2}Y ₀ [5:0]	{3}Y ₀ [5:0]	{1}Y ₀ [5:0]	{4}C _R 0 [11:6]

Word 17	Word 18	Word 19	Word 20	Word 21	Word 22
{2}A1 [8:6]	{3}A1 [8:6]	{1}A1 [8:6]	{4}A1 [11:9]	{2}A1 [11:9]	{3}A1 [11:9]
{2}C _R 0 [11:6]	{3}C _R 0 [11:6]	{1}C _R 0 [11:6]	{4}Y ₁ [11:6]	{2}Y ₁ [11:6]	{3}Y ₁ [11:6]

Word 23	Word 24	Word 25	Word 26	Word 27	Word 28
{1}A1 [11:9]	{4}A1 [2:0]	{2}A1 [2:0]	{3}A1 [2:0]	{1}A1 [2:0]	{4}A1 [5:3]
{1}Y ₁ [11:6]	{4}C _R 0 [5:0]	{2}C _R 0 [5:0]	{3}C _R 0 [5:0]	{1}C _R 0 [5:0]	{4}Y ₁ [5:0]

Word 29	Word 30	Word 31
{2}A1 [5:3]	{3}A1 [5:3]	{1}A1 [5:3]
{2}Y ₁ [5:0]	{3}Y ₁ [5:0]	{1}Y ₁ [5:0]

4.2 Audio Data

When present, audio data shall be mapped into the HANC space of data streams one through eight and shall be in conformance with SMPTE ST 299-1 and SMPTE ST 299-2.

Audio control packets shall be mapped into the odd numbered data streams.

Audio data packets shall be mapped into the even numbered data streams.

Audio control and data packets shall be mapped into the data stream pair one/two first and any remaining data shall then be mapped onto data stream pair three/four, then into data stream pair five/six and finally into data stream pair seven/eight.

The audio clock phase data as defined in the section “CLK (audio clock phase data)” of SMPTE ST 299-1 shall be calculated at the clock frequency of 148.5 (/1.001) MHz for 4:2:2 10-bit and 4:2:0 10-bit formats at 48/1.001, 48, 50, 60/1.001 and 60 Hz, which use Mapping Structure 1.

The audio clock phase data as defined in the section “CLK (audio clock phase data)” of SMPTE ST 299-1 shall be calculated at the clock frequency of 74.25 (/1.001) MHz for formats at 24/1.001, 24, 25, 30/1.001 or 30Hz, which use Mapping Structure 2, 3 or 4.

4.2.1 Number of Audio Channels

The number of audio channels is as defined in SMPTE ST 425-5 “Number of Audio Channels”

4.2.2 Audio Copy

As an alternative to the mapping of the maximum number of unique audio channels described above, blocks of audio channels may be copied within the interface. This may be as a result of the single-link 12G-SDI signal being created by combining quad-link 3G-SDI or dual-link 6G SDI signals. It may alternatively be done in the original single-link 12G-SDI signal in order to permit simple splitting of the single-link 12G-SDI signal into a quad-link 3G-SDI or a dual-link 6G-SDI signal.

Note: Audio copy reduces the number of channels that can be transported by the interface.