PROPOSED SMPTE RECOMMENDED PRACTICE

RP 160
Revision of RP 160-1991

Three-Channel Parallel Analog Component High-Definition Video Interface

1 Scope

1.1 This practice defines the physical characteristics of an interface using three parallel channels for the interconnection of equipment operating with analog component HDTV signals. For ANSI/SMPTE 240M, the signals carried across this interface have a scanning structure of 1125 lines, 60.00 fields per second, 16:9 aspect ratio, and 2:1 interlace. This interface is also appropriate for HDTV signals having other scanning structures.

1.2 The intended uses of this interface are:

– to interconnect the elements of parallel analog HDTV video subsystems which use the same component sets within larger component islands or plants. Component HDTV editing and post-production suites are examples of such subsystems;

– to interconnect equipment into complete, self-contained HDTV analog component systems of relatively small size.

1.3 This practice applies to signals carried on the connectors described in 7.1 and may not apply to component signals carried on other types of connectors. The practice also defines the preferred component video signals across the interface, including their waveform structure and levels.

2 Normative reference

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

ANSI/SMPTE 240M-1995, Television — Signal Parameters — 1125-Line High-Definition Production Systems

3 Video signals

The signals carried across this interface may be those of either of two signal sets: a color set comprising E_R', E_G', and E_B' signals, or a color-difference set comprising E_Y', E_{PB}', and E_{PR}' signals. Definitions of the signal sets may be found in ANSI/SMPTE 240M and other relevant standards. Figures 1 and 2 illustrate the waveform structure, synchronizing signal, and video levels for these two component sets.

4 Impedance

Equipment using this interface shall have nominal 75-ohm input and output impedances.

5 Clamping and signal dc content

The clamp period shown in figures 1 and 2 may be used as a dc level clamp reference point. If an ac coupled system is employed, the average dc level of any signal specified herein shall not exceed ± 1 volt.

6 Component timing

The three component video signals (E_G', E_B', E_R') or (E_Y', E_{PB}', E_{PR}') should be simultaneous in real time.

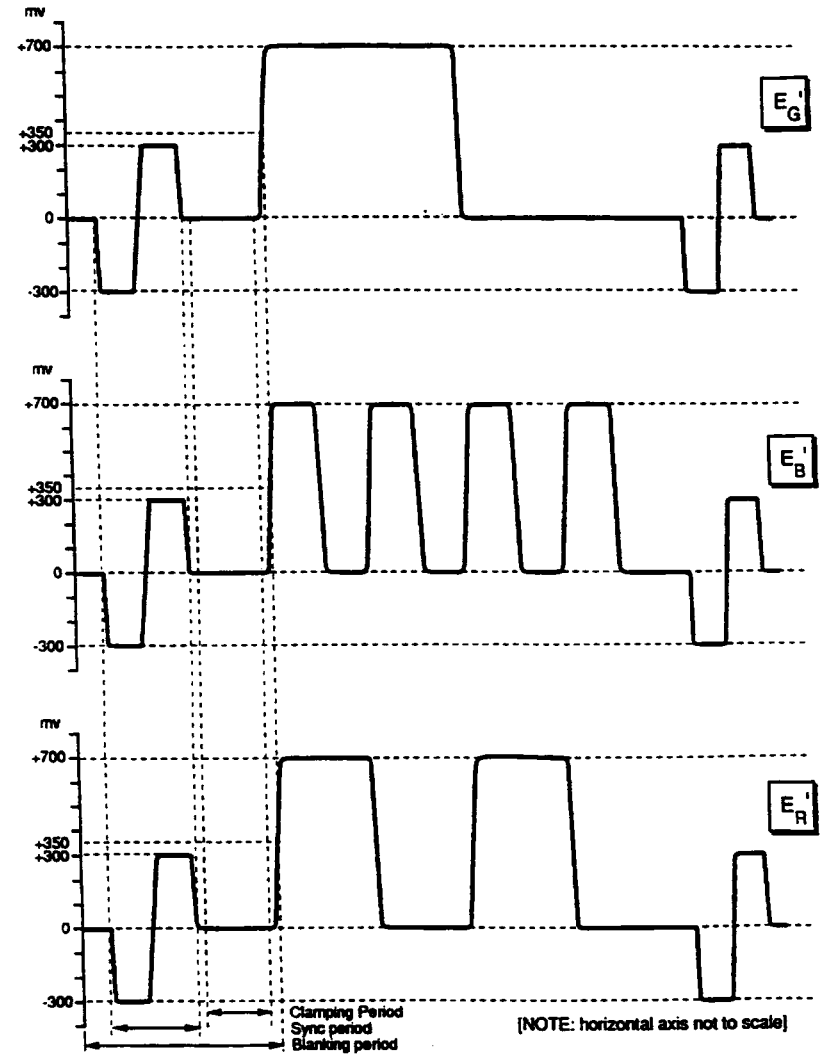

Figure 1 – Waveform structure and levels of E_G', E_B', E_R' signals for 100% color bars

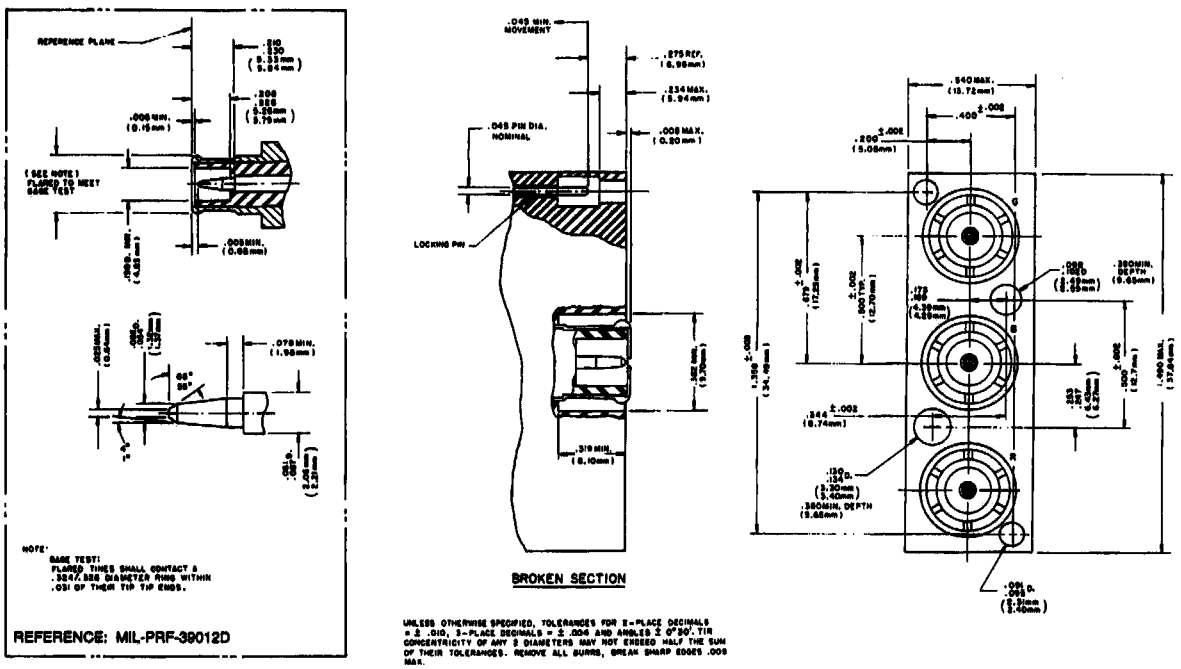

Figure 3 – Plug Interface

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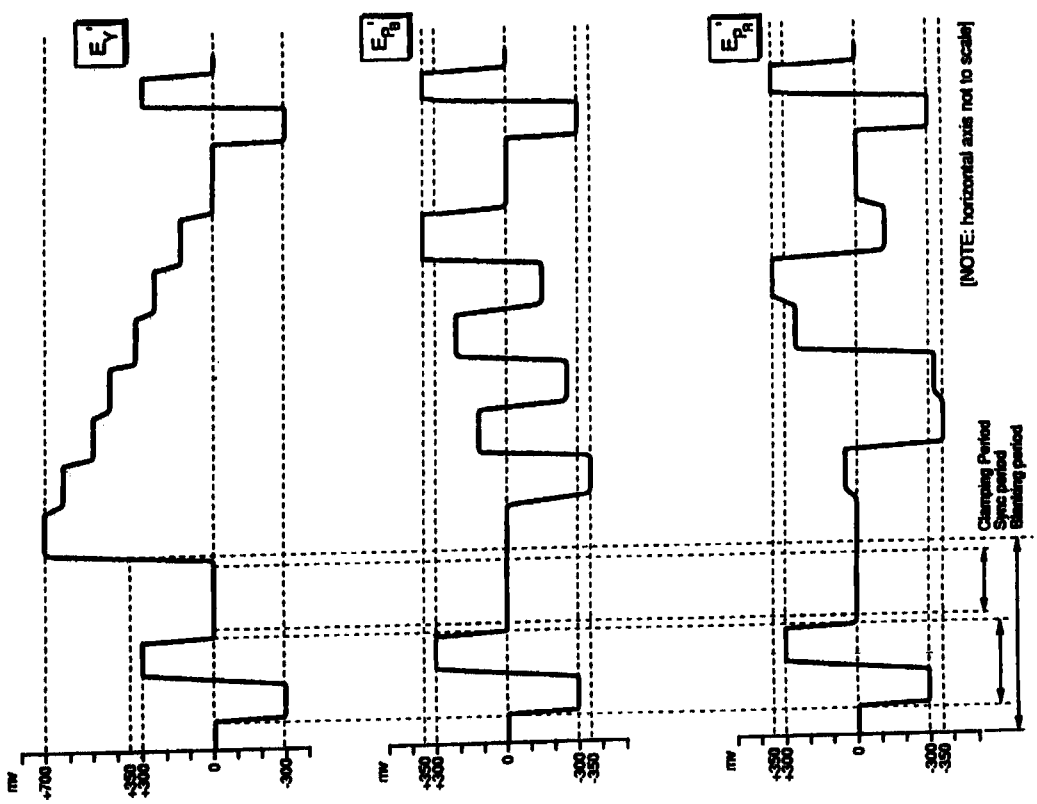

Figure 2 – Waveform structure and levels of EY', EPB' and EPR' signals for 100% color bars

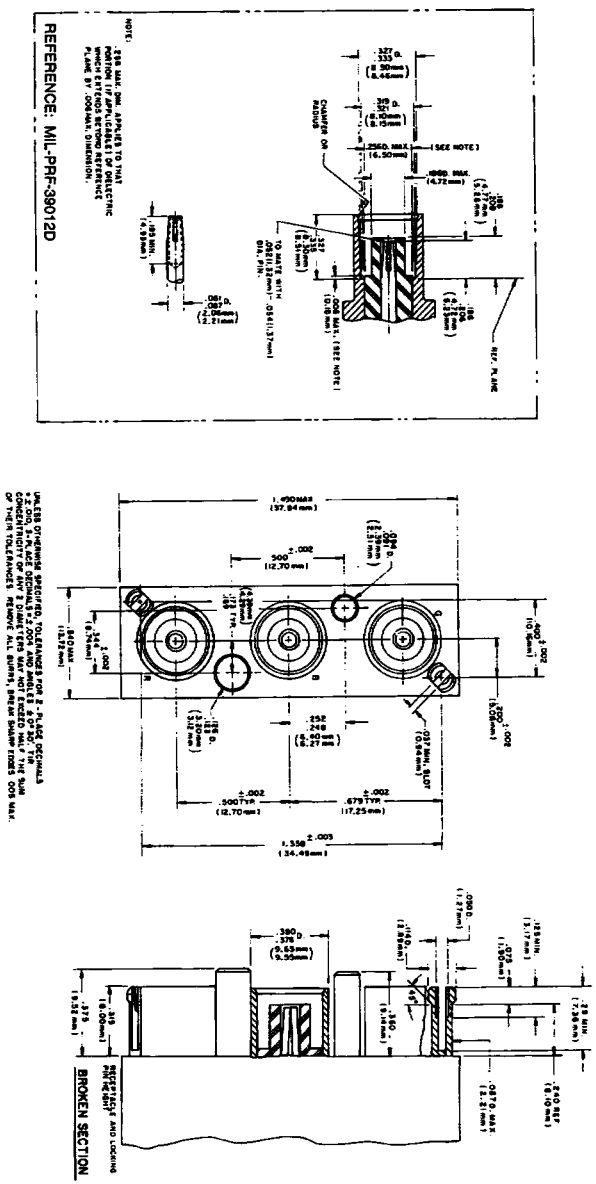

Figure 4 – Socket interface

7 Connector and cable

Two different connector implementations are permissible under this practice. The preferred implementation incorporates a single multiconductor cable and keyed connector arrangement carrying all three parallel signals. The secondary implementation utilizes three separate cables with BNC connectors carrying the three parallel signals. This clause describes the preferred implementation.

7.1 Connector

The connector consists of three BNC inserts mounted in a rectangular housing. Latching is accomplished by two latch posts and receptacles, internal to the connector. Additional posts are utilized for polarizing and reinforcing purposes.

This practice defines the dimensions and tolerances necessary to permit the interchange of plug and socket connectors that contain the three BNC inserts.

The plug interface is described in figure 3, and the socket interface in figure 4. The BNC pin and socket are derived from MIL-PRF-39012D and are described in figures 3 and 4.

Individual insert positions in each mating connector shall be marked with G, B, and R, respectively, as shown in figures 3 and 4. These position identifications correspond to the cable coding.

7.2 Cable

The recommended cable consists of three individual, insulated, coded, coaxial cables, all housed in a nonmetallic jacket.

7.2.1 Cable selection considerations

HDTV component sets as specified, for example, in ANSI/SMPTE 240M, are wideband signals. In choosing the coaxial cable to implement this interface, the user should take account of the following:

– 30-MHz bandwidth for each video component signal;

– Differential timing between each of the three coaxial cables (this refers specifically to the tolerance in cable transit time);

– Crosstalk among the three coaxial cables;

– A cable with nominal impedance of 75 ohms is recommended;

– Return loss of the cable.

7.2.2 Cable color coding

Each individual coax within this cable shall be uniquely coded to identify the signal to be carried upon it. The coding shall be:

Coax coding	Signal carried
Color green or letter G	E_G' or E_Y'
Color blue or letter B	E_B' or E_{PB}'
Color red or letter R	E_R' or E_{PR}'

Annex A (informative)
Bibliography

SMPTE 253, Television – Three-Channel RGB Analog Video Interface

MIL-PRF-39012D, General Specification for Coaxial, Radio Frequency Connectors

PROPOSED SMPTE RECOMMENDED PRACTICE

RP 196

Transmission of LTC and VITC Data as HANC Packets in Serial Digital Television Interfaces

1 Scope

This practice describes a transmission format for the transporting of linear time code (LTC) and vertical interval time code (VITC) over the SMPTE serial digital interface (ANSI/SMPTE 259M). The data packets will be transmitted in the horizontal ancillary data space (HANC). Mapping of data is for 10-bit interfaces only.

2 Ancillary data format

2.1 Ancillary data structure is shown in figure 1. Ancillary data packets carrying LTC or VITC data conform to type 2 (ANSI/SMPTE 291M) for ancillary data transmission.

2.1.1 One ancillary data block per frame shall represent LTC, if present.

2.1.2 One ancillary data block per field shall represent VITC, if present.

2.1.3 The data ID (DID) for transmission of time and control code shall be set to 164_h.

2.1.4 The secondary data ID (SDID) shall indicate if the time code user data words are derived from LTC or VITC. The values shall be set as follows:

LTC = 64_h
VITC = $7F_h$

2.1.5 The data count (DC) word shall be set to (see ANSI/SMPTE 291M):

LTC = 8
VITC = 9

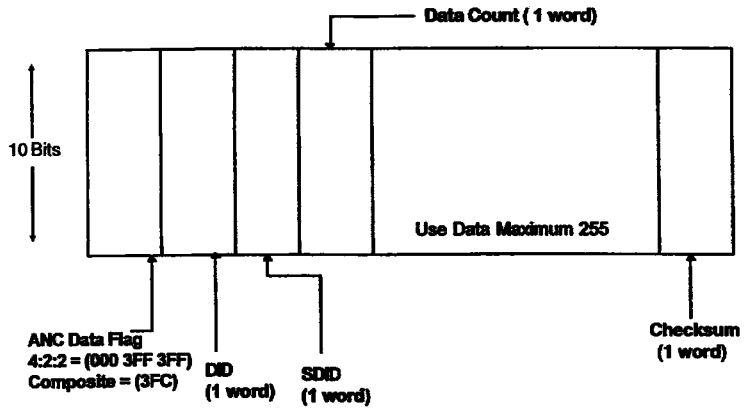

Figure 1 – Ancillary data structure

2.1.6 Tables 1a and 1b show mapping of the time and control data defined in ANSI/SMPTE 12M into user data words of the ancillary data space.

2.1.7 VITC bit mapping maps the time and binary group data as defined in ANSI/SMPTE 12M into words 0–7. Word 8 conveys VITC line selection, validity, and line-duplication information.

2.1.7.1 For VITC line allocation, word 8 b0–b5 is derived from table 2. Field identification is shown by "phase/field" bit (for 525/60 LTC, bit number 27; for 625/50 LTC, bit number 59) and is defined as 0 = field 1 and 1 = field 2, derived from ANSI/SMPTE 12M.

2.1.7.2 When the line-duplication flag, bit 6 of word 8, is set to one, it signifies that the VITC word carried in the data block shall be inserted on the selected line number when converted to the analog domain and be repeated two lines later.

Table 1a – LTC mapping

Word No.	0	1	2	3	4	5	6	7
b0 LSB	0	16	32	48	4	20	36	52
b1	1	17	33	49	5	21	37	53
b2	2	18	34	50	6	22	38	54
b3	3	19	35	51	7	23	39	55
b4	8	24	40	56	12	28	44	60
b5	9	25	41	57	13	29	45	61
b6	10	26	42	58	14	30	46	62
b7	11	27	43	59	15	31	47	63
b8	P	P	P	P	P	P	P	P
	—	—	—	—	—	—	—	—
b9 MSB	b8	b8	b8	b8	b8	b8	b8	b8

NOTE – b0-b7 correspond to the LTC bit numbers defined in ANSI/SMPTE 12M.

Table 1b – VITC mapping

Word No.	0	1	2	3	4	5	6	7	8
b0 LSB	2	22	42	62	6	26	46	66	VITC line select LSB
b1	3	23	43	63	7	27	47	67	VITC line select
b2	4	24	44	64	8	28	48	68	VITC line select
b3	5	25	45	65	9	29	49	69	VITC line select
b4	12	32	52	72	16	36	56	76	VITC line select
b5	13	33	53	73	17	37	57	77	VITC line select MSB
b6	14	34	54	74	18	38	58	78	VITC line duplication +2 (see 2.1.7.2)
b7	15	35	55	75	19	39	59	79	Validity flag
b8	P	P	P	P	P	P	P	P	P
	—	—	—	—	—	—	—	—	—
b9 MSB	b8	b8	b8	b8	b8	b8	b8	b8	b8

NOTE – b0-b7 correspond to the VITC bit numbers defined in ANSI/SMPTE 12M.

Table 2 – VITC line allocation

VITC line select b0 - b5	525/60		625/50	
	Field 1	Field 2	Field 1	Field 2
0	Line 10	273	Line 6	319
1	11	274	7	320
2	12	275	8	321
3	13	276	9	322
4	14	277	10	323
5	15	278	11	324
6	16	279	12	325
7	17	280	13	326
8	18	281	14	327
9	19	282	15	328
10	20	283	16	329
11	21	284	17	330
12	22	285	18	331
13	23	286	19	332
14	24		20	333
15	25		21	334
16	26		22	335

2.1.7.3 Word 8 b7, assigned to a validity play when set to "1," shall indicate that a reading error of sync bits or CRCC has occurred at the input interface.

3 Transmission of horizontal ancillary (HANC) time code packets

3.1 Transmission of HANC time code packets shall be at least once per frame for LTC data words, and once per field for VITC data words.

3.2 Within the television frame/field, the LTC and VITC data words shall be transmitted between lines 10-20 for 525-line systems and 6-22 for 625-line systems.

Annex A (informative)
Bibliography

ANSI/SMPTE 12M-1995, Television, Audio and Film — Time and Control Code

ANSI/SMPTE 170M-1994, Television — Composite Analog Video Signal — NTSC for Studio Applications

ANSI/SMPTE 259M-1993, Television — 10-Bit 4:2:2 Component and $4f_{sc}$ NTSC Composite Digital Signals — Serial Digital Interface

ANSI/SMPTE 291M-1996, Television — Ancillary Data Packet and Space Formatting

SMPTE RP 164-1996, Location of Vertical Interval Time Code

ITU-R BT.470-4, Television Systems