CCITT SGXV
Working Party XV/1
Specialists Group of Coding for Visual Telephony

Document #245
June 1987

SOURCE: Delta Information Systems, Inc.; USA

TITLE: A Signal Generator to Test N x 384 Kbps Decoders

At the March 1987 meeting of the Specialists Group in San Jose, USA, several organizations developing hardware for the N x 384 Kbps codecs expressed interest in a signal generator to test N x 384 Kbps decoders. Delta Information Systems, Inc. (DIS) expressed a willingness to investigate the technical and economic feasibility of such a system. A that meeting it was also requested that DIS prepare a technical specification and terms for sale of the signal generator. This has been done and several orders have been received. Work is underway on the development of the tester. A copy of the specification is attached.

Revised 5/28/87

A SIGNAL GENERATOR TO TEST N x 384 Kbit/s VIDEO DECODERS MODEL VT - P384

1.0 OVERVIEW

Study Group XV of the CCITT has formed a "Specialists Group on Coding for Visual Telephony" for the purpose of developing a Recommendation for a video codec operating at N x 384 Kbit/s. Several countries participating in the Specialists Group activity are developing Flexible Hardware Prototype equipment as part of this standardization effort. CCITT Study Group XV Document No. 182, dated December 1986, defines the Flexible Hardware. Delta Information Systems has agreed to develop a signal generator to test the N x 384 Kbit/s video decoder to assist in the development of the Flexible Hardware. The purpose of this document is to specify the technical characteristics of the tester.

2.0 ELECTRICAL CHARACTERISTICS

- GENERAL SIGNAL CHARACTERISTIC

In accordance with Study Group XV Document No. 182 dated December 1986 and Document No. 217 dated April 1987.

- POWER SOURCE

95 to 250 VAC, 50 - 60 Hz

- OUTPUT SIGNALS

Basic signal which emulates the 384 Kbit/s video encoder output:

- HDB3 Code at the primary rate of 2048 Kbit/s ± 50PPM, + 2.37 V, 75 ohms, or B8ZS Code at the primary rate of 1544 Kbit/s ± 50 PPM, +3.0 V, 100 ohms unbalanced, (either rate is switchable).
- Sync signals to assist in system analysis
  - * ISDN Multiframe sync
  - * PSC Sync
  - * Video Period Sync
  - * Bit Clock
  - * NRZ Data

#245

- SIGNAL STRUCTURE

  - o Continuous test pattern available at power up
  - o Video Period
    - * 139 Pictures
    - * 29 Service Channel Multiframes
    - * 4.64 seconds
  - o Picture Rate 29.9569 pictures/second (does not meet 29.97 ± 50 ppm spec.)
  - o Picture will have 11 equal vertical gray bars, divided on block boundaries.
  - o One GOB will have an edge moving from left to right, with a 4.64 second period.
  - o One GOB will reverse gray bars, once each video period, with 50% duty cycle using inter coding.
  - o In order to avoid a discontinuity in Time Reference (TR), TR will not repeat with indicated period, but will be incremented each time PSC is detected.

- SIGNAL STORAGE MEDIUM

  - o PROM: TYPE 27256 (32K x 8)
  - o Signal stored in 8 PROMs
  - o All signal elements except Time Reference are stored in PROMs and can be modified by changing PROMs.

3.0 MECHANICAL CONFIGURATION

- APPROXIMATE SIZE

HEIGHT:	5 1/4 inches (13 cm)
WIDTH:	13 3/4 inches (35 cm)
DEPTH:	9 1/2 inches (24 cm)
APPROMIXMATE WEIGHT:	10 pounds (4.5 kg)

- FRONT PANEL CONTROLS
  - Power switch
  - Rate Select switch

- CONNECTORS

VIDEO:	BNC UNBALANCED IS4903 BALANCED
ISDN MULTIFRAME SYNC:	BNC
PSC SYNC:	BNC
VIDEO PERIOD SYNC:	BNC
BIT CLOCK:	BNC
NRZ DATA:	BNC

#245

4.0 DOCUMENTATION

A technical manual will be delivered with each tester. The manual will include the following elements:

- Operating instructions
- Technical description
- Electrical schematic diagram
- PROM listing

5.0 WARRANTY

90 days: parts and labor

6.0 SHIPPING

F.O.B., Horsham, PA

7.0 DETAILED SIGNAL DESCRIPTION

This section describes the detailed structure and content of the video output signal.

7.1 Video Content

7.1.1 Picture Header - always present

PSC	0000 0000 0000 0001 1010 1
BS	0000 00 to 0111 10
TR	000 to 111 This is not periodic with the normal video period, but will increment by 1 for each picture, so that the pattern repeats exactly every 8 x 4.64 = 37.12 sec.
TYPE 1	0000 000
PEI	000
PGMV	Not present
PARITY	Not present
PSPARE	Not present

7.1.2 Group of Blocks Header - always present, 18 per picture

GBSC	0000 0000 0000 0001
GN	0000 1 to 1001 0 in ascending order
TYPE 2	0000 0000 00

#245

QUANT 1	1100 00 except for GN 12 which is 1101 01 for pictures 35 and 105.
GEI	000
GGMV	Not present
GSPARE1	Not present
GSPARE2	Not present

7.1.3 Block Data

7.1.3.1 Gray Bars (All GOB's except No. 6 and No. 12)

Normally present for all luminance blocks or no blocks within a GOB.

BA	1 (adjacent blocks)
TYPE 3	0001 0 (intra)
QUANT2	Not present
CLASS	1 (Zig-Zag)
DMV	Not present
TCOEFF	DC coefficient only*, a different value for each group of 4 blocks in succession in each row. The following values in order:

Luminance Value	Code
23	0001 0111 0
44	0010 1100 0
65	0100 0001 0
86	0101 0110 0
107	0110 1011 0
128	1111 1111 1
149	1001 0101 0
170	1010 1010 0
191	1011 1111 0
212	1101 0100 0
233	1110 1001 0

EOB	001

* Except for a few blocks with additional coefficients needed to obtain the exact number of video bits (1,484,800) in 139 pictures.

#245

7.1.3.2 Moving Edge (GOB No. 6)

For Initial Picture in Video Period, for all luminance blocks:

BA	1 (adjacent blocks)
TYPE 3	0001 0 (intra)
QUANT2	Not present
CLASS	01 (Horizontal)
DMV	Not present
TCOEFF	DC coefficient only. For first five blocks in each row: 0010 0001 0 (luminance value 33) For last 39 blocks in each row: 1101 1110 0 (luminance value 222)
EOB	001

For subsequent pictures (138) in Video Period, the edge will move 2 pels per picture. For 2 luminance blocks in each picture:

BA	For upper row of blocks, start at 0001 1 (5) and increment BA by 1 every 4 pictures. For lower row of blocks, always use 0000 0001 0010 1010 (43)
TYPE 3	0001 0 (intra)
QUANT 2	Not present
CLASS	01 (Horizontal)
DMV	Not present
TCOEFF	Changes with a 4 picture cycle, as in Table below:

Picture 2 (and 6, 10, ...)

	Quantization (QSEL = 16)	Code
(DC)	350	1010 1111 0
	-30	0000 0001 0100 0010
	-21	0000 0001 0010 1010
	-10	0000 0001 0000 1101
	0	1
	0	1
	0	1
	7	0000 0001 0000 0011
	9	0000 0001 0000 1001
	6	0000 0011

#245

Picture 3 (and 7, 11, ...)

(DC)	255	0111 1111 1
	-42	0000 0001 0110 0010
	0	1
	15	0000 0001 0001 1001
	0	1
	0	1
	0	1
	-10	0000 0001 0000 1101
	0	1
	8	0000 0001 0000 0101

Picture 4 (and 8, 12, ...)

(DC)	161	0101 0000 1
	-30	0000 0001 0100 0010
	21	0000 0001 0010 1001
	-10	0000 0001 0000 1101
	0	1
	0	1
	0	1
	7	0000 0001 0000 0011
	-9	0000 0001 0000 1010
	6	0000 0011

Picture 5 (and 9, 13, ...)

(DC)	66	0010 0001 0
EOB		001

7.1.3.3 Reversing Bars (GOB No. 12)

Picture 1 will be identical to the Gray Bar GOB's. In addition, this GOB will be coded only for pictures 35 and 105. Picture 35 will have inter codes that reverse the gray bars (left for right) and picture 105 will reverse them back to their original state.

BA	1 (adjacent blocks, except 0001 0 after 4 blocks not coded)
TYPE 3	11 (inter)
QUANT 2	Not present
CLASS	1 (Zig-Zag)
DMV	Not present
TCOEFF	DC coefficient only, a different value for each group of 4 blocks in succession in each row of blocks. The following values are used in order for picture 35 and in reverse order for picture 105.

#245

Luminance Difference Value	Quantized Value (QSEL=21)	Code
210	10	0000 0001 0000 1010
168	8	0000 0001 0000 0101
126	6	0000 0011
84	4	0000 11
42	2	011
0	0	Blocks not coded
-42	-2	0001 1
-84	-4	0001 0
-126	-6	0000 0001 0000 0001
-168	-8	0000 0001 0000 0110
-210	-10	0000 0001 0000 1011
EOB	001	

7.2 Audio Content

In each frame 0101 010

7.3 Service Channel Content

Pattern cycles over 1,280 ISDN frames (160 msec) as indicated in Figure 1.

7.4 2048 KBPS ISDN Frame Content

Multiframe length is 4096 bits (16 frames of 32 octets) or 2 msec.

CRC is not used.

Content is shown in Figure 2.

7.5 1544 KBPS ISDN Frame Content

Multiframe length is 4632 bits (24 frames of 193 bits) or 3 msec.

CRC is not used.

Content is shown is Figure 3.

7.6 HDB3 Code

0's are represented by a voltage less than ± 0.237 volts.

1's are pulses nominally 244 nsec wide, alternately + 2.37 volts and -2.37 volts in amplitude.

If 4 consecutive bits are 0, they are replaced by 000V and P00V for an odd or even number of 1's following the last V, where P is a mark with polarity opposite to the previous mark, and V is a mark with the same polarity as the previous mark (violation).

7.7 B8ZS Code

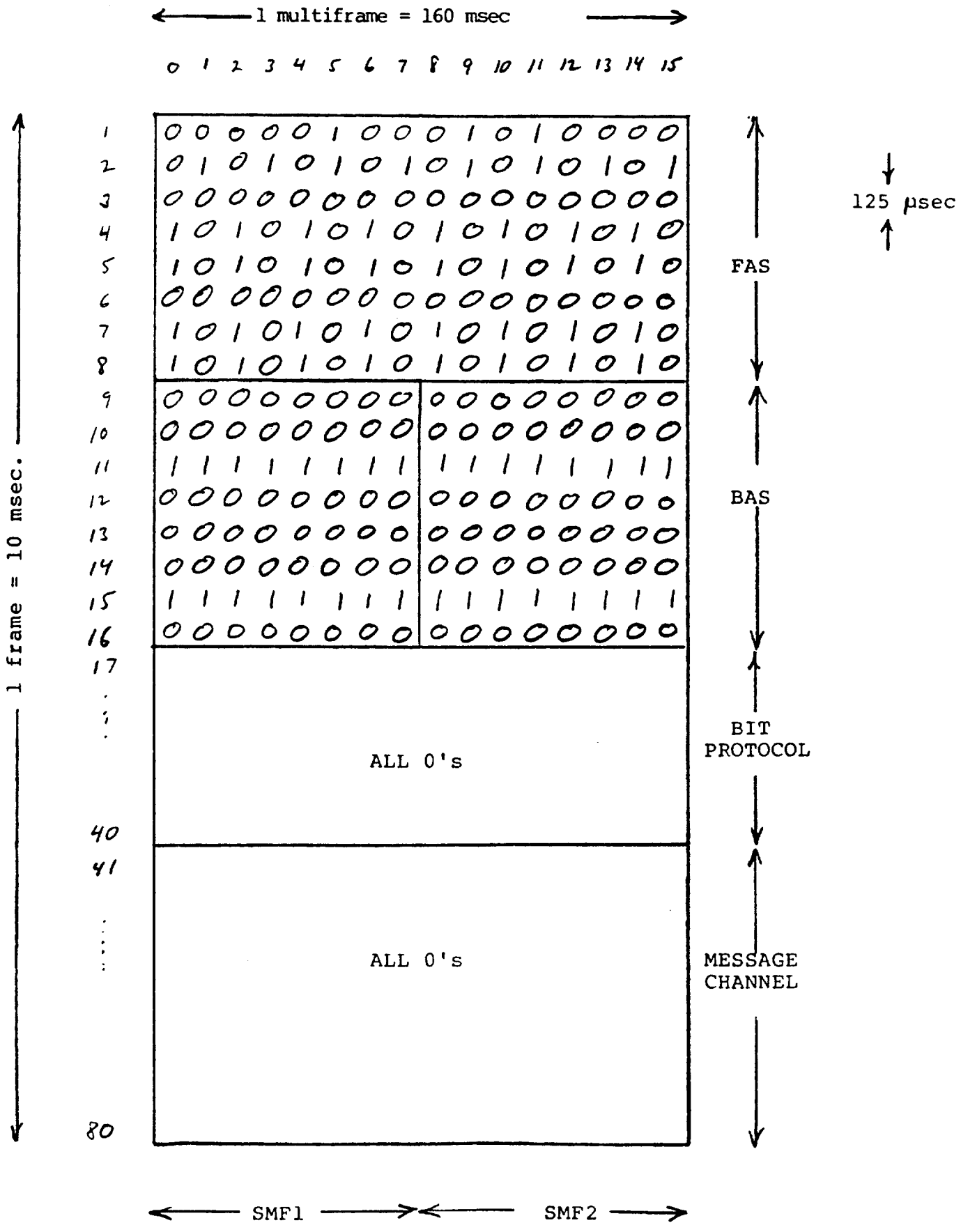
0's are represented by a voltage less than ± 0.3 volts.

1's are pulses nominally 324 nsec wide, alternately +3.0 volts and -3.0 volts in amplitude.

If 8 consecutive bits are 0, they are replaced by 000+-0-+ or 000-+0+- if the preceding pulse was + or - respectively.

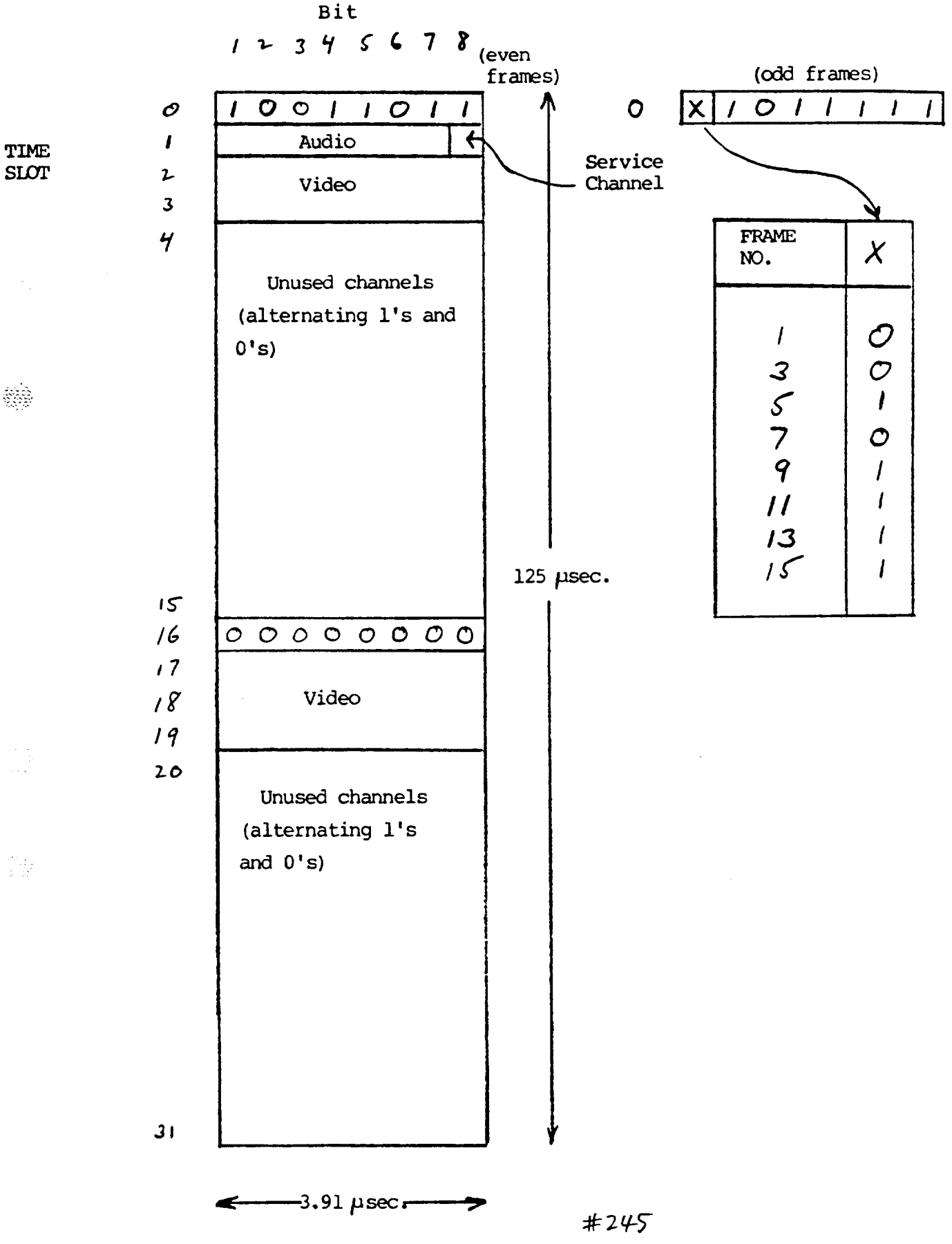
#245

FIGURE 1 - SERVICE CHANNEL CONTENTS



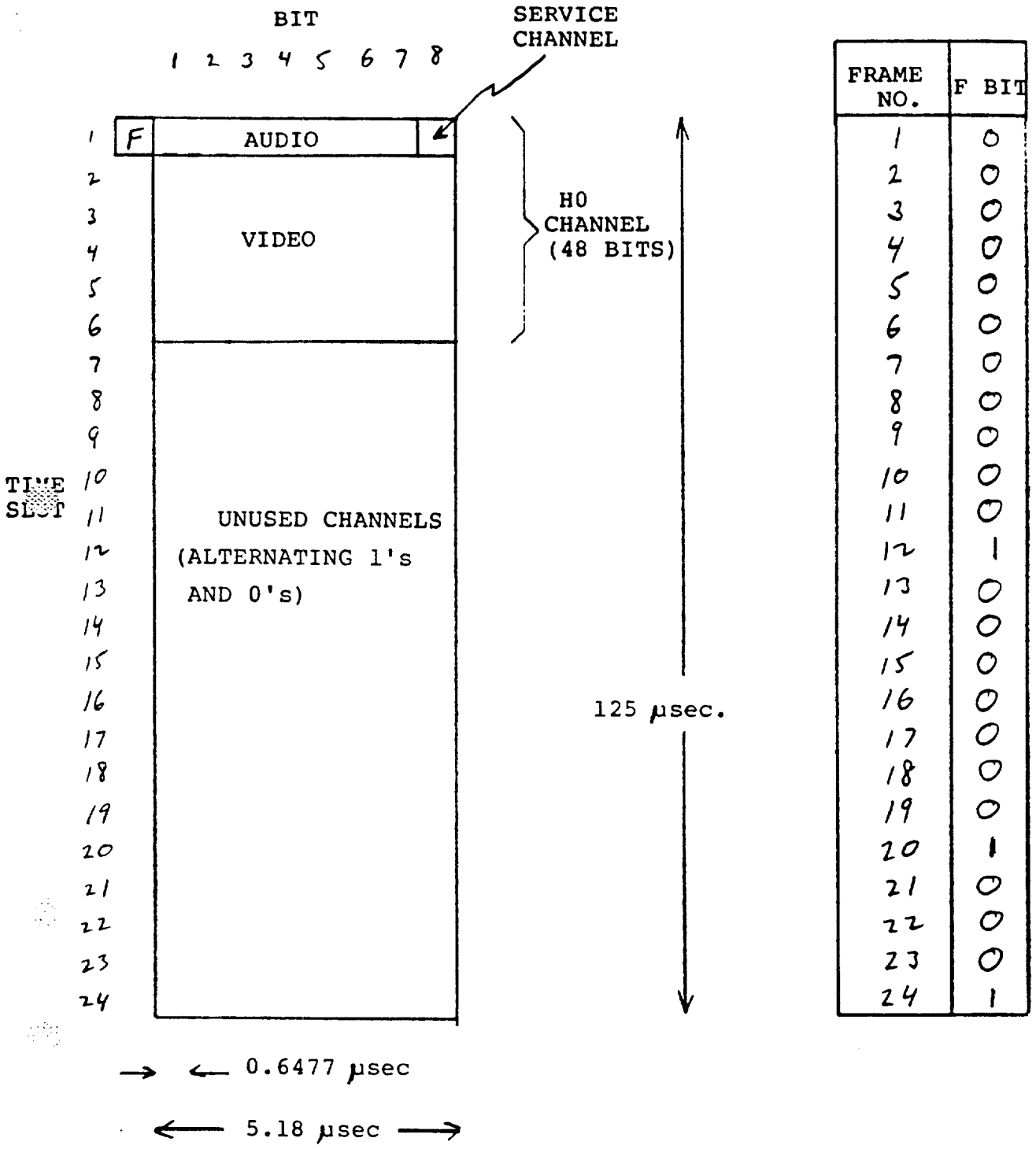
#245

FIGURE 2 - 2048 KBPS FRAME CONTENTS



#245

FIGURE 3 - 1544 KBPS FRAME CONTENTS



FRAME NO.	F BIT
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	1
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	1
21	0
22	0
23	0
24	1

#245