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RP 156-1999
Revision of RP 156-1995

SMPTE RECOMMENDED PRACTICE

Bar Code Labeling for Type D-1 Component and Type D-2 Composite Cassette Identification

1 Scope

This practice describes the requirements for the generation of bar code labels for the automatic identification of type D-1 component and type D-2 composite cassettes. Dimensions and tolerances of the printed bar code symbols are specified. The symbol encoding, data structure, and formatting of the label information are also specified. Lastly, the label characteristics, size, orientation, and placement are specified. This practice includes both rear and side labels.

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 226M-1996, Television Digital Recording — 19-mm Tape Cassettes

3 Bar code symbology

The interleaved 2 of 5 bar code shall be the symbology used for the identification of type D-1 and type D-2 cassettes.

3.1 General description

The interleaved 2 of 5 bar code is a bidirectional, self checking, numerical bar code. Different start and stop characters are employed to permit bidirectional decoding. This bar code is a two-level code and employs a combination of wide and narrow elements to represent each symbol. The elements may be either bars or spaces. Wide elements are assigned a value of 1 and narrow elements a value of 0.

The characters are interleaved using bars to encode symbols in the odd data positions and spaces to encode symbols in the even positions. The position numbering of the symbols begins with the first character after the start character (data 0). The interleaving process always requires an even number of characters. For example, if an odd number of characters must be encoded, a leading 0 shall be used to change the number of characters to an even number (as shown in figure 1).

3.2 Code configuration

Each symbol is comprised of five elements, two of which are wide and three narrow. Table 1 shows the code symbology for characters 0 through 9.

Table 1 – Interleaved 2 of 5 bar code symbology

Character	Code
0	00110
1	10001
2	01001
3	11000
4	00101
5	10100
6	01100
7	00011
8	10010
9	01010

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595 W. Hartsdale Ave., White Plains, NY 10607
(914) 761-1100

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The start and stop characters are encoded as follows (see figure 1):

– start character 0000;
– stop character 100.

The start character is constituted by two narrow bars and two narrow spaces. The stop character is constituted by one wide bar, one narrow space, and one narrow bar.

The start character is at the normal left-hand end adjacent to the most significant character. The stop character is at the normal right-hand end adjacent to the least significant character.

The interleaved 2 of 5 bar code is continuous because there are no intercharacter gaps; all spaces contain information. Figures 1 and 2 show examples of encoded data.

3.3 Alphanumeric data

For rear labels, mixed use of alpha characters, numerics, and symbols shall be permitted in fields defined as alphanumeric. These characters are encoded using a pair of numeric symbols. Symbol encoding is shown in table 2. Encoding for alphanumeric characters may be calculated from the standard ASCII value according to the formula shown below.

Conversion from ASCII to the required format may be accomplished by subtracting 20_{hex} from the hexadecimal ASCII code and then converting the result to base 10.

$$\text{Required form} = \{ [\text{ASCII}]_{hex} - [20]_{hex} \}_{10}$$

Refer to ANSI X3.4 for details concerning ASCII encoding. Table 2 defines alphanumeric characters that may be used for cassette bar code labels. An example of alpha encoding is as follows:

To encode the letter A

$$\begin{array}{rl} \text{ASCII} & 41_{\text{hex}} \\ - & 20_{\text{hex}} \\ \hline & 21_{\text{hex}} = 33_{10} \end{array}$$

The position of alphanumeric data is defined by the label format.

Alphanumeric data shall be encoded, decoded, or both only in fields defined as alphanumeric.

3.4 Code density and dimensions

The significant parameters of the interleaved 2 of 5 code are the width of the narrow elements and the ratio of the width of wide to narrow elements. For optimum automatic scanning, the bar height (see table 3), the code's position on the label, and the label's orientation on the cassette shall be specified (see 4.2 and 4.3, 5.1.1 and 5.1.2, 5.2.1 and 5.2.2).

The width of a narrow element shall be 0.26 mm for rear labels and 0.68 mm for side labels. The minimum and maximum width of an element is determined by the application and constraints imposed by the specific scanning equipment. This application requires the symbols to be printed in accordance with the ratios and tolerances specified in table 3.

The ratio of the width of the wide elements to that of the narrow elements shall be 2.5:1.

The width of the various elements and the nominal ratio of the width of the wide to narrow elements shall not change within a given bar code label.

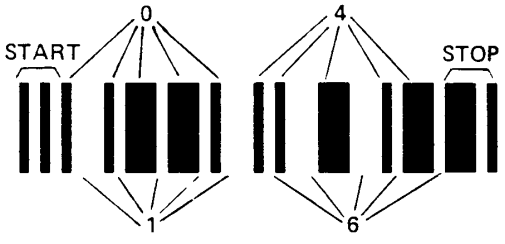

Figure 1 – Interleaved 2 of 5 bar code symbol Encoding 0146

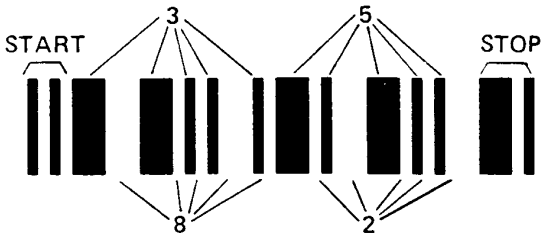

Figure 2 – Interleaved 2 of 5 bar code symbol Encoding 3852

Table 2 – Bar encoding of alphanumeric data

Upper	0	1	2	3	4	5	6	7	8	9
Lower										
0	SP	*	4	>	H	R	\	f	p	z
1	!	+	5	?	I	S	]	g	q	{
2	“	, 6	@	J	T	^	h	r	|	
3	#	-	7	A	K	U	_	i	s	}
4	$	.	8	B	L	V	‘	j	t	~
5	%	/	9	C	M	W	a	k	u	
6	&	0	:	D	N	X	b	l	v	
7	’	1	;	E	O	Y	c	m	w	
8	(	2	<	F	P	Z	d	n	x	
9	)	3	=	G	Q	[	e	o	y	[Note 2]

NOTES
1 SP represents a space character.
2 Data 99 is reserved and is invalid as an alphanumeric code. Refer to 4.4.

Table 3 – Bar code element dimensions and tolerances (All dimensions in millimeters)

Label	Narrow element width (W) ± (T)	Wide element width	Wide/narrow ratio (N)	Bar height
Rear	0.26 ± 0.078	0.65	2.5	5.0 ± 0.1
Side	0.68 ± 0.23	1.70	2.5	10.0 ± 0.5

3.5 Bar and space width tolerances

The allowable printing width tolerance (T) is a function of the nominal width (W) of the narrow bars and spaces and the nominal ratio (N) of the wide to narrow elements. The tolerance is defined as follows:

$$T = \pm\left(\frac{18N - 21}{80}\right)W$$

The values of N for any interleaved 2 of 5 symbol must be in the range of 2 to 3. For the narrow element width and the specified ratio, the dimensions shall be as given in table 3.

4. Bar code label details

4.1 Rear label

There shall be three areas of information on the rear bar code label. These are listed from the top of the label to the bottom and each occupies the full length of the label (see figure 3):

– user information area;
– bar code symbols;
– human readable interpretation of the bar code.

At each end of the bar code label, there shall be a quiet zone. The zone shall extend for a minimum of 3.5 mm beyond each end of the bar code extending toward the edges of the label. No markings of any kind

are permitted in this area. For interchange of tape cassettes, any human readable information printed on this label shall be in the English language.

4.2 Rear label size and placement

The rear bar code label shall be affixed to the cassette in the recessed area designated as the rear label area as described in ANSI/SMPTE 226M.

The rear label dimensions shall be as follows (see figure 3):

– length 138.7 mm ± 0.2 mm;
– width 17.5 mm + 3.0 mm – 0.1 mm.

The label's thickness shall be in accordance with the specifications of ANSI/SMPTE 226M.

The label shall be oriented such that the label information can be read when the cassette is viewed from the rear edge with the top label area uppermost.

4.3 Label format

Information areas, dimensions, and tolerances for the rear-label area are shown in figure 3.

4.4 Rear label bar code data format

The data in table 4 shall be encoded to identify the contents of a cassette.

4.5 Type number

The type number defines the cassette as either a single-event cassette containing one identified event or as a multievent cassette containing two or more identified events.

4.5.1 Type No. 0, Single-event cassette

The SOM and DUR fields on the label define the cue points for the identified event.

4.5.2 Type No. 1, Multiple-event cassette

The SOM defines the time code location of an on-tape directory containing the location of each identified segment on the tape. The DUR on the label is the sum of the individual segment durations that have been identified and are contained in the on-tape directory.

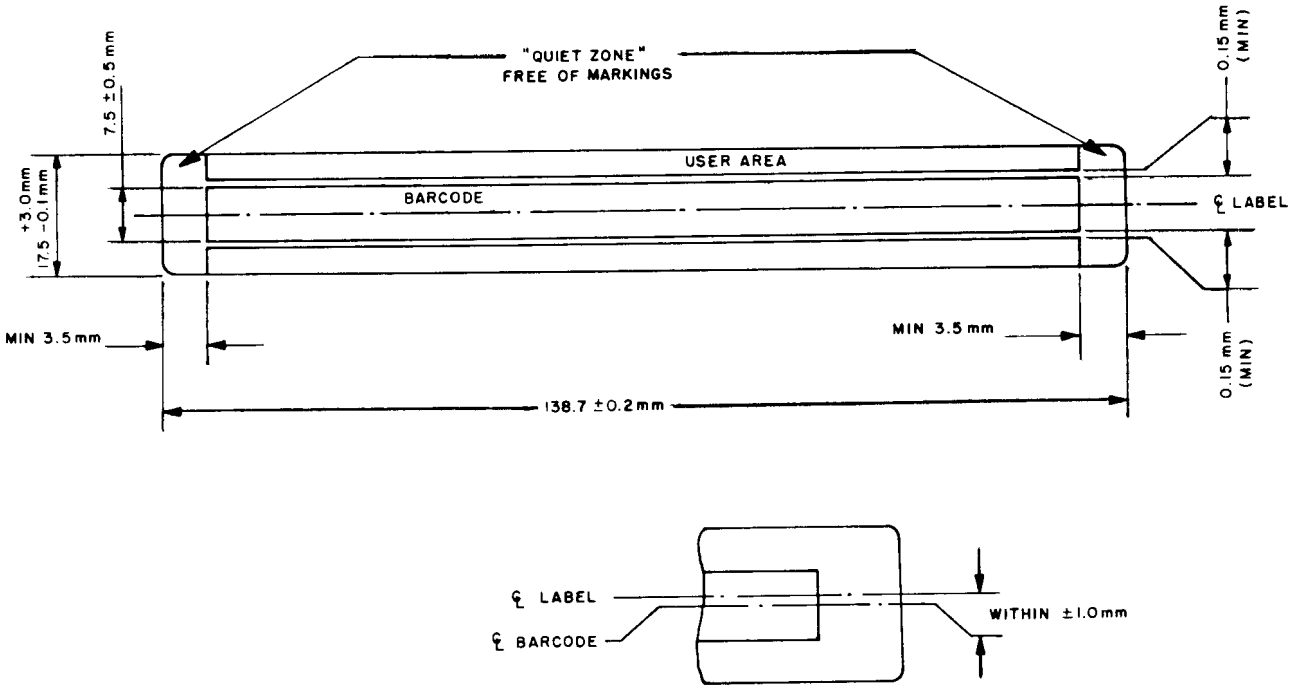

Figure 3 – Rear label information areas, dimensions and tolerances

Table 4 – Rear label bar code data format

Symbol position	Field	Type	Note
0	Type number	Numeric	1
1 → n	Identification number	Alphanumeric	2
n + 1 → n + 2	Separator		2
n + 3 → 40	Title	Alphanumeric	2
41 → 48	Start of message (SOM)	Numeric	3
49 → 56	Duration (DUR)	Numeric	3
57	Checksum	Numeric	4

NOTES

1 The type number shall be used to define the contents of the cassette as either a single-event (0) cassette or a multievent (1) cassette. A single bar code symbol is used to specify the type number. Type numbers 2 to 9 are reserved.

2 The identification number and title fields are alphanumeric and require 2 bar code symbols per character. A 20-character block is allocated to these fields. The identification number may be between 3 and 8 characters in length. A separator code is used to indicate the end of the identification number and the beginning of the title. The title data fills the remainder of the 20-character block. The separator code is always defined as 99 and is an unprinted character that is reserved in the alphanumeric table for this purpose.

3 The SOM and DUR are numeric and are in the HHMMSSFF format.

4 S3,S2,S1 is the three-digit resultant of the following expression:

(S3,S2,S1) = 3x (data0+data2+data4+ ... +data56) + (data1+data3+data5+ ... +data55).

S1 is the least significant digit of that resultant and is used to calculate the checksum.

Checksum = 10 – S1. If S1 = 0, then checksum = 0.

An example of data encoded in the correct format is shown in figure 4 and the resulting bar code label is shown in figure 5.

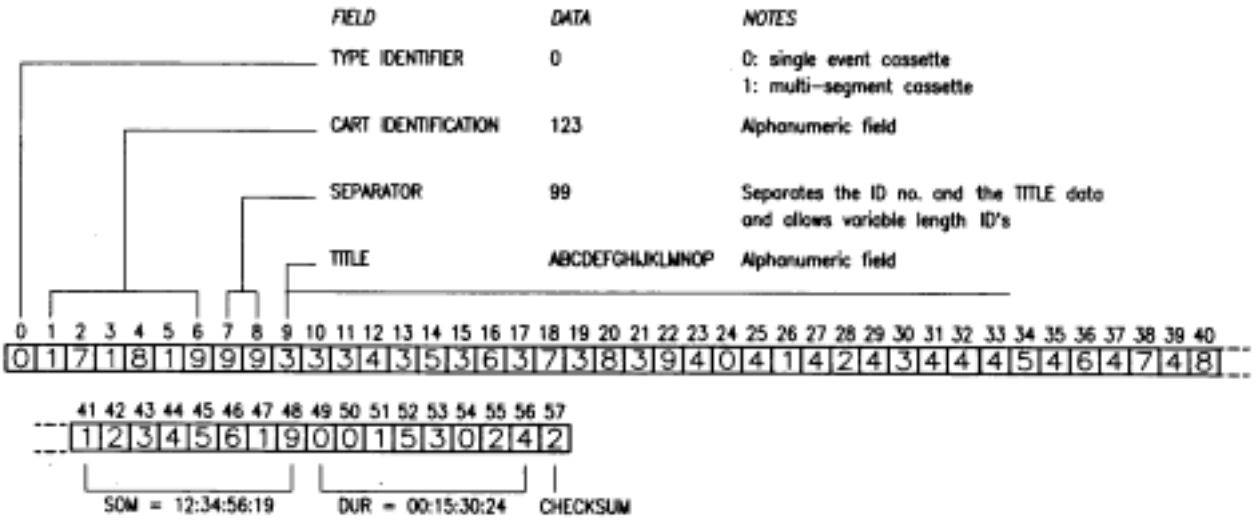

Figure 4 – Rear label bar code format

Figure 5 – Sample rear bar code label

4.6 Identification number and title

The identification number and title fields are alpha-numeric and variable in length. The total combined length is 20 alphanumeric characters (including the separator). This separator marks the end of the identification number data and the beginning of the title data.

The cassette identification number is the primary identifier for the cassette. The minimum length shall be 3 characters and the maximum 8 characters. Leading spaces in this field are not permitted. Unused space in the field shall be filled with spaces (ASCII = 20_{hex}).

The title occupies the remaining portion of the field. The maximum size of the title field is 16 characters and the minimum 11 (corresponding to the minimum and maximum length of the identification number). Unused space in this field shall be filled with space characters.

4.7 SOM and DUR

Both fields are numeric and are formatted in the HHMMSSFF format. The start of message (SOM) defines a time code location to be interpreted as defined in 4.5.

The duration (DUR) for type 0 cassettes shall specify the desired duration of the material.

The duration (DUR) for type 1 cassettes shall be the sum of the segment durations identified on the tape.

4.8 Rear label user information area

This area is reserved for user information and does not contain any essential machine readable data. Printed information in this area shall be separated vertically from the bar code by a space of not less than 0.15 mm. The last two characters at the right end of the user information area are reserved and shall indicate the type of cassette, using the letter S for a type 0 (single event) cassette and the letter M for a type 1 (multiple event) cassette (see 4.5).

4.9 Rear label bar code symbol area

This area contains the machine readable information and is formatted as described in 4.4. The bar code shall be centered vertically on the label within 1 mm of the label's horizontal centerline.

4.10 Rear label human readable interpretation

This area is reserved for a translation of the bar code identification number, title, SOM, and DUR data. Printed information in this area shall be separated vertically from the bar code by a space of not less than 0.15 mm.

5 Side labels

5.1 Right-side label

The areas of information on the right-side label are identified and located as shown in figure 6:

– bar code symbols;
– human readable interpretation of the bar code.

At each end of the bar code label, there shall be a quiet zone. The zone shall extend for 9.0 mm ± 0.5 mm beyond each end of the bar code and is also shown in figure 6.

5.1.1 Right-side label size and placement

The right-side label shall be affixed to the side-label area of the cassette as shown in figure 7.

The right-side label dimensions shall be as follows:

– length: 58.5 mm ± 0.5 mm;
– width: 20.5 mm ± 0.5 mm.

The label's thickness shall be in accordance with specifications defined in ANSI/SMPTE 226M.

The label shall be oriented such that the label information can be read when the cassette is viewed from the side with the top label area uppermost.

5.1.2 Right-side label format

Information areas, dimensions, and tolerances for the right-side label are shown in Fig. 7.

5.1.3 Right-side label bar code symbol area

This area contains the machine readable information and is formatted as described in 3.2. The bar code shall be nominally offset 2 mm vertically above the centerline of the label.

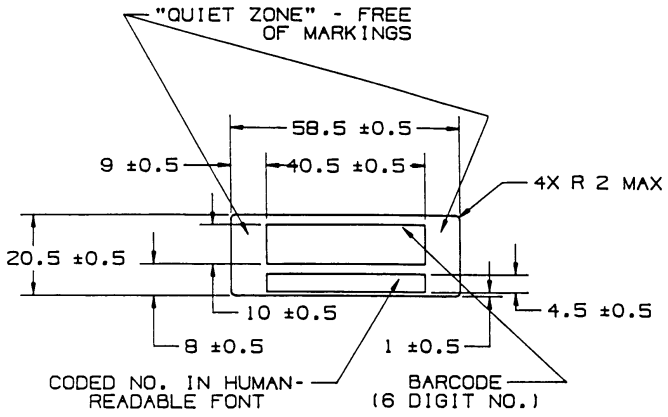

Figure 6 – Right-side label information areas, dimensions and tolerances

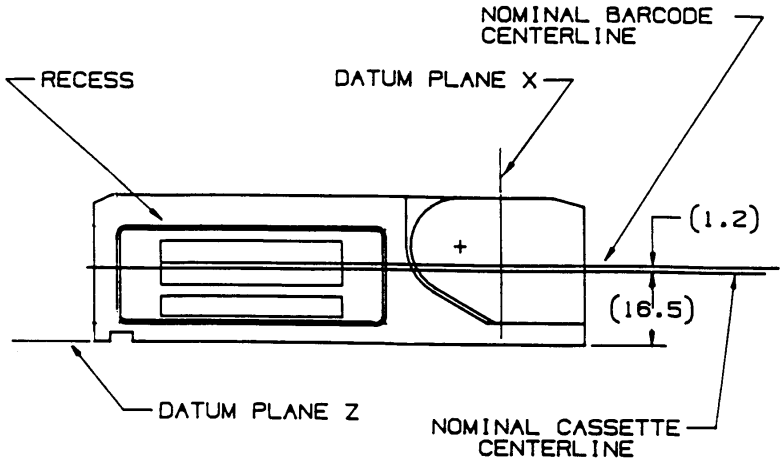

Figure 7 – Location of right-side label

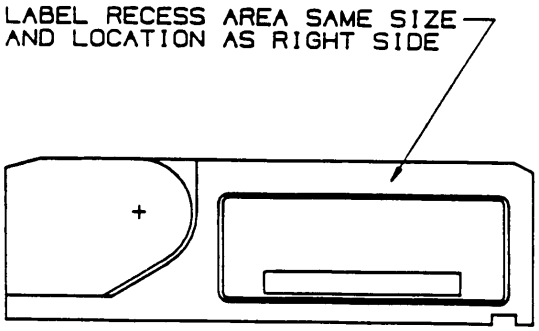

Figure 8 – Location of left-side label

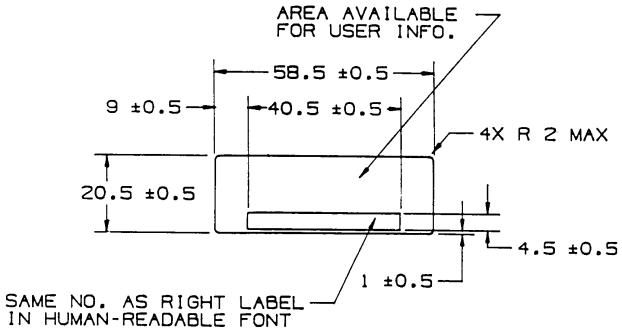

Figure 9 – Left-side information areas, dimensions and tolerances

5.1.4 Right-side label bar code data format

The right-side label contains a single field of 6 numeric digits for cassette identification purposes and the start and stop characters as described in 3.2. No other data are encoded in this area.

The checksum is excluded due to the low density of these data.

5.1.5 Right-side label human readable interpretation

This area is a translation of the bar encoded data. The order of the translated information will correspond to the encoded data.

5.2 Left-side label

Optionally, another side label may be affixed to the left side of the cassette as shown in figure 8.

There shall be two areas of information on the optional left-side labels, located as shown in figure 9:

– user information area;
– human readable interpretation of the bar code on the left side of the cassette.

5.2.1 Left-side label size and placement

The left-side label shall be affixed to the side-label area of the cassette as shown in figure 8.

The left-side label dimensions, thickness, and orientation shall be as specified in 5.1.1.

The dimensions and tolerancing of this optional label are shown in figure 9.

5.2.2 Left-side label user information area

The optional left-side label may be utilized for user information and shall, as a minimum requirement, contain the human readable interpretation of the bar code which is on the right side.

If a bar code is included in the user information area of the left-side label, it shall be located as shown (for the right-side label) in figure 6.

6 Printing and scanning requirements

Detailed information regarding printing of bar codes, paper type, ink selection, and the requirements of the bar code scanner may be found in ANSI MH10.8M.

Annex A (informative)
Bibliography

ANSI MH10.8M-1993, Materials Handling — Unit Loads and Transport Packages — Bar Code Symbols

ANSI X3.4-1986 (R1997), Information Systems — Coded Character Sets — 7-Bit American National Standard Code for Information Interchange (7-Bit ASCII)