American National Standard

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FIPS 36

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graphic representation of the control characters of american national standard code for information interchange

american national standards institute, inc.
1430 broadway, new york, new york 10018

X3.32-1973

This standard was approved as a Federal Information Processing Standard by the Secretary of Commerce on March 6, 1975.

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ANSI
X3.32-1973

American National Standard Graphic Representation of the Control Characters of American National Standard Code for Information Interchange

Secretariat

Computer and Business Equipment Manufacturers Association

Approved July 3, 1973

American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not a part of American National Standard Graphic Representation of the Control Characters of American National Standard Code for Information Interchange, X3.32-1973.)

American National Standard Code for Information Interchange (ASCII) was first issued in 1963 and then published twice again with minor revisions as X3.4-1967 and X3.4-1968. Since then, it was found that in certain applications there is a need for a graphic representation of the normally nonprinting control characters. Different proposals for a pictorial representation were considered and exchanged with the European Computer Manufacturers Association (ECMA), Technical Committee 1. At the same time, the Deutscher Normenausschuss (DNA) proposed an alphanumeric abbreviation. That work was also considered in the development of the present standard.

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Computers and Information Processing, X3. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the X3 Committee had the following members:

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Contents

American National Standard Graphic Representation of the Control Characters of American National Standard Code for Information Interchange

1. Scope

1.1 This standard provides a graphic representation of the control characters given in columns 0 and 1 of the Standard Code table contained in American National Standard Code for Information Interchange, X3.4-1968 (ASCII). It also provides for the normally nonprinting character SPACE (position 2/0 of the ASCII table) and for the character DELETE (position 7/15 of the ASCII table).

1.2 The standard contains two alternative sets of representations: a pictorial representation and an alphanumeric representation.

2. Application

These representations are intended for use in the display of control characters on devices, where the graphic representation of these normally nonprinting characters is required. Among the devices included are paper tape punches, diagnostic printers, and cathode-ray tube devices.

3. Qualifications

3.1 There may be no need to implement all symbols.

3.2 Each pictorial or alphanumeric representation is to be considered as a single symbol. It may occupy either one or more than one position on a printed or displayed line, depending on the implementation. Pictorial and alphanumeric representation may be intermixed in a single display.

3.3 The precise font design for the symbols is not a part of the standard.

3.4 This standard does not abrogate the use of the three character abbreviations defined in ASCII for applications where they are desired.

3.5 While optical recognition of the graphic representations given in this standard may be feasible, machine readability was not an objective of the standard.

4. Standard Graphic Representations

Code Position	Character	Pictorial Representation	Alphanumeric Representation
0/0	NUL		NU
0/1	SOH		SH
0/2	STX		SX
0/3	ETX		EX
0/4	EOT		ET
0/5	ENQ		EQ
0/6	ACK		AK
0/7	BEL		BL
0/8	BS		BS
0/9	HT		HT
0/10	LF		LF

NOTE: The pictorial representation of 0/5 is a schematic representation of ✠ which may also be used when equipment allows.

Code Position	Character	Pictorial Representation	Alphanumeric Representation
0/11	VT		VT
0/12	FF		FF
0/13	CR		CR
0/14	SO		SO
0/15	SI		SI
1/0	DLE		DL
1/1	DC1		D1
1/2	DC2		D2
1/3	DC3		D3
1/4	DC4		D4
1/5	NAK		NK
1/6	SYN		SY

Code Position	Character	Pictorial Representation	Alphanumeric Representation
1/7	ETB		EB
1/8	CAN		CN
1/9	EM		EM
1/10	SUB		SB
1/11	ESC		EC
1/12	FS		FS
1/13	GS		GS
1/14	RS		RS
1/15	US		US
2/0	SP		SP
7/15	DEL		DT

5. Legend

5.1 Control Characters

NUL	Null
SOH	Start of Heading (CC)
STX	Start of Text (CC)
ETX	End of Text (CC)
EOT	End of Transmission (CC)
ENQ	Enquiry (CC)
ACK	Acknowledge (CC)
BEL	Bell (audible or attention signal)
BS	Backspace (FE)
HT	Horizontal Tabulation (punched card skip) (FE)
LF	Line Feed (FE)
VT	Vertical Tabulation (FE)
FF	Form Feed (FE)
CR	Carriage Return (FE)
SO	Shift Out
SI	Shift In
DLE	Data Link Escape (CC)
DC1	Device Control 1
DC2	Device Control 2
DC3	Device Control 3
DC4	Device Control 4 (Stop)
NAK	Negative Acknowledge (CC)
SYN	Synchronous Idle (CC)
ETB	End of Transmission Block (CC)
CAN	Cancel
EM	End of Medium
SUB	Substitute
ESC	Escape
FS	File Separator (IS)
GS	Group Separator (IS)
RS	Record Separator (IS)
US	Unit Separator (IS)
DEL	Delete[1]

5.2 Graphic Character

SP	Space (normally nonprinting)

NOTE: CC – Communication Control
FE – Format Effector
IS – Information Separator

[1] In the strict sense, DEL is not a control character.

Appendix

(This Appendix is not a part of American National Standard Graphic Representation of the Control Characters of American National Standard Code for Information Interchange, X3.32-1973, but is included for information purposes only.)

Font Design Considerations for the Alphanumeric Representations

A1. 7 × 9 Dot Pattern

The 7 × 9 dot pattern representation given in Table A1 illustrates the feasibility of implementing the standard. It can also be used as a guide for designing vector-generated or hard-type character representations.

A2. 5 × 7 Dot Pattern

The 5 × 7 dot pattern representation given in Table A1 illustrates the feasibility of reducing the entropy required to form the characters and still retain legibility.

A3. Meaning of Symbols

Symbols selected in pictorial representations are similar to some currently in use in five-level applications. They should cause no ambiguity, since their meaning can be easily derived from the context in which they are used.

A4. Criteria for Symbols

Symbols were chosen to be: (1) clearly printable by impact printers, (2) clearly displayable by matrix devices, (3) interpretable with no ambiguity, and (4) suggestive of the control function to be performed. Not all of these criteria were met for all symbols; however, the best possible compromise was adopted.

Table A1
Dot Pattern Representation

Character	7 X 9 Matrix	5 X 7 Matrix	Character	7 X 9 Matrix	5 X 7 Matrix
NUL			DLE		
SOH			DC1		
STX			DC2		
ETX			DC3		
EOT			DC4		
ENQ			NAK		
ACK			SYN		
BEL			ETB		
BS			CAN		

(Continued on next page)

Table A1 – *Continued*

Character	7 X 9 Matrix	5 X 7 Matrix	Character	7 X 9 Matrix	5 X 7 Matrix
HT			EM		
LF			SUB		
VT			ESC		
FF			FS		
CR			GS		
SO			RS		
SI			US		
SP			DEL		
NL					

NOTE: NL is the abbreviation for New Line, which is defined in ASCII as an alternate definition to the code for Line Feed (LF). Its graphic representation in this table is for information only.

American National Standards on Computers and Information Processing

X3.1-1969 Synchronous Signaling Rates for Data Transmission

X3.2-1970 Print Specifications for Magnetic Ink Character Recognition

X3.3-1970 Bank Check Specifications for Magnetic Ink Character Recognition

X3.4-1968 Code for Information Interchange

X3.5-1970 Flowchart Symbols and Their Usage in Information Processing

X3.6-1965 (R1973) Perforated Tape Code for Information Interchange

X3.9-1966 FORTRAN

X3.10-1966 Basic FORTRAN

X3.11-1969 Specification for General Purpose Paper Cards for Information Processing

X3.12-1970 Vocabulary for Information Processing

X3.14-1973 Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)

X3.15-1966 Bit Sequencing of the American National Standard Code for Information Interchange in Serial-by-Bit Data Transmission

X3.16-1966 Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange

X3.17-1974 Character Set and Print Quality for Optical Character Recognition (OCR-A)

X3.18-1974 One-Inch Perforated Paper Tape for Information Interchange

X3.19-1974 Eleven-Sixteenths Inch Perforated Paper Tape for Information Interchange

X3.20-1967 (R1974) Take-Up Reels for One-Inch Perforated Tape for Information Interchange

X3.21-1967 Rectangular Holes in Twelve-Row Punched Cards

X3.22-1973 Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI)

X3.23-1974 Programming Language COBOL

X3.24-1968 Signal Quality at Interface Between Data Processing Terminal Equipment and Synchronous Data Communication Equipment for Serial Data Transmission

X3.25-1968 Character Structure and Character Parity Sense for Parallel-by-Bit Communication in the American National Standard Code for Information Interchange

X3.26-1970 Hollerith Punched Card Code

X3.27-1969 Magnetic Tape Labels for Information Interchange

X3.28-1971 Procedures for the Use of the Communication Control Characters of American National Standard Code for Information Interchange in Specified Data Communication Links

X3.29-1971 Specifications for Properties of Unpunched Oiled Paper Perforator Tape

X3.30-1971 Representation for Calendar Date and Ordinal Date for Information Interchange

X3.31-1973 Structure for the Identification of the Counties of the United States for Information Interchange

X3.32-1973 Graphic Representation of the Control Characters of American National Standard Code for Information Interchange

X3.34-1972 Interchange Rolls of Perforated Tape for Information Interchange

X3.36-1975 Synchronous High-Speed Data Signaling Rates between Data Terminal Equipment and Data Communication Equipment

X3.37-1974 Programming Language APT

X3.38-1972 Identification of States of the United States (Including the District of Columbia) for Information Interchange

X3.39-1973 Recorded Magnetic Tape for Information Interchange (1600 CPI, PE)

X3.40-1973 Unrecorded Magnetic Tape for Information Interchange (9-Track 200 and 800 CPI, NRZI, and 1600 CPI, PE)

X3.41-1974 Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange

X3.44-1974 Determination of the Performance of Data Communication Systems

X3.45-1974 Character Set for Handprinting

X3.46-1974 Unrecorded Magnetic Six-Disk Pack (General, Physical, and Magnetic Characteristics)

X3.49-1975 Character Set for Optical Character Recognition (OCR-B)

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