American National Standard

Adopted for Use by the Federal Government

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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 has been adopted for Federal Government use.

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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.

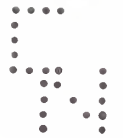
A3. Meaning of Symbols

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.

X3.115-1984 Unformatted 80 Megabyte Trident Pack for Use at 370 tpi and 6000 bpi (General, Physical, and Magnetic Characteristics)

X3.117-1984 Printable/Image Areas for Text and Facsimile Communication Equipment

X3.118-1984 Financial Services – Personal Identification Number – PIN Pad

X3.119-1984 Contact Start/Stop Storage Disk, 158361 Flux Transitions per Track, 8.268 Inch (210 mm) Outer Diameter and 3.937 inch (100 mm) Inner Diameter

X3.120-1984 Contact Start/Stop Storage Disk

X3.121-1985 Two-Sided, Double-Density, Unformatted 5.25-inch (130-mm), 48-tpi (1,9-tpmm), Flexible Disk Cartridge for 7958 bpr Use

X11.1-1977 Programming Language MUMPS

IEEE 416-1978 Abbreviated Test Language for All Systems (ATLAS)

IEEE 716-1982 Standard C/ATLAS Language

IEEE 717-1982 Standard C/ATLAS Syntax

IEEE 770X3.97-1983 Programming Language PASCAL

IEEE 771-1980 Guide to the Use of ATLAS

MIL-STD-1815A-1983 Reference Manual for the Ada Programming Language

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X3/TRI-82 Dictionary for Information Processing Systems (Technical Report)

American National Standards for Information Processing

X3.1-1976 Synchronous Signaling Rates for Data Transmission
X3.2-1970 Print Specifications for Magnetic Ink Character Recognition
X3.4-1977 Code for Information Interchange
X3.5-1970 Flowchart Symbols and Their Usage
X3.6-1965 Perforated Tape Code
X3.9-1978 Programming Language FORTRAN
X3.11-1969 General Purpose Paper Cards
X3.14-1983 Recorded Magnetic Tape (200 CPI, NRZI)
X3.15-1976 Bit Sequencing of the American National Standard Code for Information Interchange in Serial-by-Bit Data Transmission
X3.16-1976 Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange
X3.17-1981 Character Set for Optical Character Recognition (OCR-A)
X3.18-1974 One-Inch Perforated Paper Tape
X3.19-1974 Eleven-Sixteenths-Inch Perforated Paper Tape
X3.20-1967 Take-Up Reels for One-Inch Perforated Tape
X3.21-1967 Rectangular Holes in Twelve-Row Punched Cards
X3.22-1983 Recorded Magnetic Tape (800 CPI, NRZI)
X3.23-1974 Programming Language COBOL
X3.25-1976 Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange
X3.26-1980 Hollerith Punched Card Code
X3.27-1978 Magnetic Tape Labels and File Structure
X3.28-1976 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
X3.31-1973 Structure for the Identification of the Counties of the United States
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
X3.36-1975 Synchronous High-Speed Data Signaling Rates between Data Terminal Equipment and Data Communication Equipment
X3.37-1980 Programming Language APT
X3.38-1972 Identification of States of the United States (Including the District of Columbia)
X3.39-1973 Recorded Magnetic Tape (1600 CPI, PE)
X3.40-1983 Unrecorded Magnetic Tape (9-Track 800 CPI, NRZI; 1600 CPI, PE; and 6250 CPI, GCR)
X3.41-1974 Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange
X3.42-1975 Representation of Numeric Values in Character Strings
X3.43-1977 Representations of Local Time of the Day
X3.44-1974 Determination of the Performance of Data Communication Systems
X3.45-1982 Character Set for Handprinting
X3.46-1974 Unrecorded Magnetic Six-Disk Pack (General, Physical, and Magnetic Characteristics)
X3.47-1977 Structure for the Identification of Named Populated Places and Related Entities of the States of the United States for Information Interchange
X3.48-1977 Magnetic Tape Cassettes (3.810-mm [0.150-Inch] Tape at 32 bpmm [800 bpi], PE)
X3.49-1975 Character Set for Optical Character Recognition (OCR-B)
X3.50-1976 Representations for U.S. Customary, SI, and Other Units to Be Used in Systems with Limited Character Sets
X3.51-1975 Representations of Universal Time, Local Time Differentials, and United States Time Zone References
X3.52-1976 Unrecorded Single-Disk Cartridge (Front Loading, 2200 BPI) (General, Physical, and Magnetic Requirements)
X3.53-1976 Programming Language PL/I
X3.54-1976 Recorded Magnetic Tape (6250 CPI, Group Coded Recording)
X3.55-1982 Unrecorded Magnetic Tape Cartridge, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase encoded
X3.56-1977 Recorded Magnetic Tape Cartridge, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase Encoded
X3.57-1977 Structure for Formatting Message Headings Using the American National Standard Code for Information Interchange for Data Communication Systems Control
X3.58-1977 Unrecorded Eleven-Disk Pack (General, Physical, and Magnetic Requirements)
X3.59-1981 Magnetic Tape Cassettes, Dual Track Complementary Return-to-Bias (CRB) Four-States Recording on 3.81-mm (0.150-Inch) Tape
X3.60-1978 Programming Language Minimal BASIC
X3.61-1978 Representation of Geographic Point Locations
X3.62-1979 Paper Used in Optical Character Recognition (OCR) Systems
X3.63-1981 Unrecorded Twelve-Disk Pack (100 Megabytes) (General, Physical, and Magnetic Requirements)
X3.64-1979 Additional Controls for Use with American National Standard Code for Information Interchange
X3.66-1979 Advanced Data Communication Control Procedures (ADCCP)
X3.72-1981 Parallel Recorded Magnetic Tape Cartridge, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase Encoded
X3.73-1980 Single-Sided Unformatted Flexible Disk Cartridge (for 6631-BPR Use)
X3.74-1981 Programming Language PL/I, General-Purpose Subset
X3.76-1981 Unformatted Single-Disk Cartridge (Top Loading, 200 tpi 4400 bpi) (General, Physical, and Magnetic Requirements)
X3.77-1980 Representation of Pocket Select Characters
X3.78-1981 Representation of Vertical Carriage Positioning Characters in Information Interchange
X3.79-1981 Determination of Performance of Data Communications Systems That Use Bit-Oriented Communication Procedures
X3.80-1981 Interfaces between Flexible Disk Cartridge Drives and Their Host Controllers
X3.82-1980 One-Sided Single-Density Unformatted 5.25-Inch Flexible Disk Cartridge (for 3979-BPR Use)
X3.83-1980 ANSI Sponsorship Procedures for ISO Registration According to ISO 2375
X3.84-1981 Unformatted Twelve-Disk Pack (200 Megabytes) (General, Physical, and Magnetic Requirements)
X3.85-1981 1/2-Inch Magnetic Tape Interchange Using a Self Loading Cartridge
X3.86-1980 Optical Character Recognition (OCR) Inks
X3.88-1981 Computer Program Abstracts
X3.89-1981 Unrecorded Single-Disk, Double-Density Cartridge (Front Loading, 2200 bpi, 200 tpi) (General, Physical, and Magnetic Requirements)
X3.91M-1982 Storage Module Interfaces
X3.92-1981 Data Encryption Algorithm
X3.93M-1981 OCR Character Positioning
X3.95-1982 Microprocessors — Hexadecimal Input/Output, Using 5-Bit and 7-Bit Teleprinters
X3.96-1983 Continuous Business Forms (Single-Part)
X3.98-1983 Text Information Interchange in Page Image Format (PIF)
X3.99-1983 Print Quality Guideline for Optical Character Recognition (OCR)
X3.100-1983 Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment for Packet Mode Operation with Packet Switched Data Communications Network
X3.101-1984 Interfaces Between Rigid Disk Drive(s) and Host(s)
X3.102-1983 Data Communication Systems and Services — User-Oriented Performance Parameters
X3.103-1983 Unrecorded Magnetic Tape Minicassette for Information Interchange, Coplanar 3.81 mm (0.150 in)
X3.104-1983 Recorded Magnetic Tape Minicassette for Information Interchange, Coplanar 3.81 mm (0.150 in), Phase Encoded
X3.105-1983 Data Link Encryption
X3.106-1983 Modes of Operation for the Data Encryption Algorithm
X3.110-1983 Videotex/Teletext Presentation Level Protocol Syntax
X3.112-1984 14-in (356-mm) Diameter Low-Surface-Friction Magnetic Storage Disk
X3.114-1984 Alphanumeric Machines; Coded Character Sets for Keyboard Arrangements in ANSI X4.23-1982 and X4.22-1983

(continued on reverse)