1. Introduction. This document proposes the addition to the UCS of 217 new graphic characters to provide compatibility with a wide range of home computers, or “microcomputers,” manufactured approximately from the mid-1970s to the mid-1980s, and with the teletext broadcasting standard originally developed in the early 1970s.

2. History. Box-drawing characters, solid and shaded blocks, and similar graphic characters were encoded in the UCS in 1991 (Unicode 1.0) for compatibility with established character sets, both in popular microcomputers—particularly the IBM PC—and in terminal-emulation software. The set of block characters was augmented in 1999 (Unicode 3.0) and in 2002 (Unicode 3.2) to cover additional platforms, due largely to proposals by Frank da Cruz (L2/98-353 through -355, L2/98-413, and L2/00-159), which also included C1 and EBCDIC control pictures, hex byte pictures, and some other graphic characters that were not accepted.

Over the years that followed, suggestions were occasionally made on the Unicode public mailing list to add characters from legacy platforms, but few formal proposals emerged. One that did was “Proposal to create a new block for missing Block Element characters,” by Eduardo Marín Silva (L2/17-194), which proposed five characters from the Sinclair ZX80 and ZX81 character sets.

A list discussion in April 2017 concerning the “PETSCII” character set, used in various forms by Commodore home computers ranging from the PET (1977) to the C128 (1985), led to the formation of an ad-hoc Terminals Working Group, which is responsible for this document.

Computers of this era enjoyed a great deal of popularity—the Commodore 64 is still, to this day, the largest-selling single computer model of all time—and spawned a large number of computer clubs and user groups devoted to these machines. Some of the original user groups are still in existence, and new ones, often online-only, have emerged more recently. The characters proposed here are intended to benefit these users and hobbyists, by providing round-trip convertibility of character data between legacy platforms and the UCS. They may also facilitate the creation of software for these platforms, such as emulators and cross-assemblers, and have been requested by developers of present-day text-mode applications as well, to enhance pseudo-graphical displays.
3. Microcomputer platforms. The group considered the following platforms and character sets:

- Apple 8-bit computers (II, II Plus, Ile, III, and the 16-bit IIGS), including MouseText
- Atari 8-bit computers (400, 800, XL, XE) (“ATASCII”)
- Atari 16-bit computers (ST, STE, TT, Falcon), including the GEM windowing system
- Commodore 8-bit computers (PET, VIC-20, 64, 128) (“PETSCII”)
- Commodore Amiga (500, 1000, etc.)
- Sinclair 8-bit computers (ZX80, ZX81, ZX Spectrum, and Timex Sinclair equivalents)
- Tandy TRS-80 computers (TRS-80 Model I, Model III, Model 4, Color Computer)
- Texas Instruments TI-99/4A

For many of these platforms, information about the character sets and text and graphics modes was available only through scanned copies of user manuals and photographs of screens showing a full or partial character dump. The group considered additional, lesser-used platforms, such as the Mattel Aquarius, but found even less supporting information; in some cases, it was impossible to identify certain characters used by these machines.

4. Teletext. Teletext was a service invented in the United Kingdom in the early 1970s for broadcasting pages of information, generally text and simple block graphics, to analog television receivers via the vertical blanking interval. Teletext found its greatest popularity in Europe, where it was commonplace until the adoption of digital television; almost all analog television sets sold in Europe since the early 1980s had built-in teletext decoders.

Several different 7-bit character sets were defined for teletext, including a complete set of $2 \times 3$ block graphics (64 in all), analogous to the block quadrants found in other platforms, as well as additional mosaic graphics. There was also a set of 27 control characters which could be used to select foreground and background color, character height (single or double), and other attributes, similar to those found in the ISO 6429 (ANSI X3.64, ECMA-48) standard which was introduced later. Figure 9 illustrates several of these display techniques used on a single page. At least one line of microcomputers (the BBC Model B Microcomputer, manufactured by Acorn) supported a teletext display mode.

Later versions of the teletext specification included features such as (relatively) high-resolution graphics and dynamically redefinable character sets (DRCS), which are not considered in this document.

5. Graphic characters. Most of the characters proposed in this document are semigraphics: block-style symbols which could be combined to simulate an all-points-addressable graphic display. Many platforms used these text characters to support a so-called “graphics mode”: small blocks could be “plotted” at various coordinates, and the appropriate full-sized block character consisting of the necessary “on” and “off” blocks would be displayed in text mode (Figure 8). The set also includes numerous box-drawing and shading characters, and some miscellaneous characters such as arrows and stick figures, which were present in the target platforms.

The word “sextant” is used in this document, by analogy with “quadrant”—a term used for certain UCS characters since 1999—to refer to a semigraphics block consisting of six smaller blocks or “cells” arranged in two columns and three rows. In the teletext specification, characters in this group could be displayed either with the cells joined together, as with the existing quadrant characters, or with a narrow space between cells. A teletext emulator could interpret the control character U+001A (“separated
graphics”) to display space between cells, or U+0019 (“contiguous graphics”) to revert to the default, joined appearance (Figure 11).

Four of the 64 sextant block characters were unified with existing characters: the left and right half blocks and full block were unified with the visually identical U+258C, U+2590, and U+2588, while the empty block can be mapped to an existing space character with suitable properties, such as U+00A0 NO-BREAK SPACE.

Other line-drawing and partial-block characters proposed in this document were determined not to be unifiable with existing characters. For example, the horizontal one-eighth blocks are similar in nature to the horizontal scan line characters at U+23BA through U+23BD and U+2500, but are defined strictly in terms of an 8-row cell, just as the horizontal scan lines are defined in terms of a 9-row cell. In a similar way, and additionally because of source separation, the two 4 × 4 checkerboards from PETSCII could not be unified with U+2592 MEDIUM SHADE or with the proposed U+1FBA0 INVERSE MEDIUM SHADE. New semigraphics characters proposed here are intended to “fit together” visually, the same way the existing ones do.

Some of the graphic characters are intended to be used together, to represent line-drawing images that would not fit within a single character block. Examples include LEFT, MIDDLE, and RIGHT THIRD WHITE RIGHT POINTING INDEX from the TRS-80 Model III and Model 4, and LEFT and RIGHT HALF RUNNING MAN from MouseText on the Apple IIc. These are analogous to U+2320 TOP HALF INTEGRAL and U+2321 BOTTOM HALF INTEGRAL, which like the present characters were encoded for compatibility.

6. BORDER-COLOURED FULL BLOCK. Microcomputers typically displayed video output on a television instead of a monitor, and usually displayed a visible border around the text or graphics content. Because this border was often prominent, many microcomputers defined a separate “border color” in addition to foreground and background colors. The TI-99/4A, uniquely, had a text character that displayed as a full block in the same color as the border (Figure 5), called the edge character in Texas Instruments documentation; U+1FBAF BORDER-COLOURED FULL BLOCK is proposed as the functional equivalent of this character.

7. Seven-segment digits. The character set for Atari 16-bit machines (ST and successors) defined clones of the ASCII digits 0 through 9, styled as upright (i.e. not oblique) seven-segment digits, in the code space below 0x20. These styled digits were particularly popular in Atari ST applications, where they were used in separate domains from regular ASCII digits, such as game scores. Representatives of the Atari ST user community have specifically requested these characters. They are proposed here at code points U+1FBF0 through U+1FBF9.

8. Characters not proposed. Not all characters identified in the target platforms were deemed suitable for encoding. For example, the character set for Atari 16-bit machines included two characters for the left and right halves of the Atari logo, and four which could be arranged to form an image of the fictional character J.R. “Bob” Dobbs (see Wikipedia article). Both of these symbols, like the existing Apple logo, were determined to be IP-encumbered and thus are not proposed here.

Glyphs from lesser-used platforms that the group observed but could not identify are also not proposed, as described above.
Characters that could not be attested in any of the target platforms are not proposed. One code point, \text{U+1FBA3}, was left unassigned in this proposal as a placeholder for the as-yet unattested \text{*LEFT HALF BLOCK AND RIGHT HALF INVERSE MEDIUM SHADE}, which would be the reverse-video equivalent of \text{U+1FB9D RIGHT HALF MEDIUM SHADE} from the Aquarius.

“Reverse video” or “inverse video” characters, which were present on nearly all microcomputers of the 1970s and 1980s and often served the same purpose that bold or italic characters serve today, have been determined to be out of scope for the UCS and are not proposed here. In a previous version of this proposal (L2/17-435), they were proposed as variation sequences. The ISO 6429 display sequences \text{SGR 7} (“negative image”) and \text{SGR 0} (“default rendition”) are suggested as a higher-level protocol to achieve this effect.

Control characters from microcomputer platforms and teletext were considered, but also determined to be out of scope for the UCS. These characters were located in what would today be considered the C0 control range (0x00–0x1F) or the C1 control range (0x7F–0x9F). Processes that need to interchange these codes should simply interchange the binary C0 or C1 value, extended to the UCS code space but without further mapping. Emulators should treat these control codes as appropriate for the targeted environment.

9. Character names. At least since the 1970s, international SDOs such as ECMA and national bodies such as ANSI and BSI have assigned names to the elements of coded character sets. By contrast, vendors of microcomputers, and even the developers of the teletext standard, tended to provide at best a code chart or image of a screen showing the character set, usually without names. We have attempted to invent names for these characters that are meaningful, unique, and conformant to WG2 and UTC guidelines.

10. Ordering and code point assignment. The proposed characters are presented roughly in groups: block sextants are together, followed by other mosaic graphics, and so forth. Although the exact order of these characters within their groups is not an overriding concern, it seems reasonable that the groups should be kept together.

All characters (with the exception of two arrows which seemed to fit logically within an existing block) are shown here with a suggested code point in a new block (1FB00..1FBFF) that is unassigned and adjacent to existing symbol blocks, according to the “Roadmap to the SMP,” version 10.0.0. A placeholder block name, “Graphics for Legacy Computing,” is listed in the summary form. However, it is understood that final assignment of blocks, code points, and block and character names is completely at the discretion of UTC and/or WG2.

11. Implementation. To assist implementers of emulators and conversion tools with the variety of mechanisms discussed in this proposal—existing and new block graphics characters, control codes, ISO 6429 sequences for reverse video, and so forth—the group has developed an extensive set of mapping tables, providing suggested mappings from the legacy character sets and the UCS. The group is also drafting a Unicode Technical Note to explain the mechanisms and recommended techniques for working with them.
12. Unicode character properties.

2B96;ARROW POINTING UPWARDS THEN NORTH WEST;So;0;ON;;;;;N;;;;;
2B97;ARROW POINTING RIGHTWARDS THEN CURVING SOUTH WEST;So;0;ON;;;;;N;;;;;
1FB01;BLOCK SEXTANT-2;So;0;ONT;;;;;N;;;;;
1FB02;BLOCK SEXTANT-12;So;0;ONT;;;;;N;;;;;
1FB03;BLOCK SEXTANT-3;So;0;ONT;;;;;N;;;;;
1FB04;BLOCK SEXTANT-13;So;0;ONT;;;;;N;;;;;
1FB05;BLOCK SEXTANT-23;So;0;ONT;;;;;N;;;;;
1FB06;BLOCK SEXTANT-123;So;0;ONT;;;;;N;;;;;
1FB07;BLOCK SEXTANT-4;So;0;ONT;;;;;N;;;;;
1FB08;BLOCK SEXTANT-14;So;0;ONT;;;;;N;;;;;
1FB09;BLOCK SEXTANT-24;So;0;ONT;;;;;N;;;;;
1FB0A;BLOCK SEXTANT-124;So;0;ONT;;;;;N;;;;;
1FB0B;BLOCK SEXTANT-34;So;0;ONT;;;;;N;;;;;
1FB0C;BLOCK SEXTANT-134;So;0;ONT;;;;;N;;;;;
1FB0D;BLOCK SEXTANT-234;So;0;ONT;;;;;N;;;;;
1FB0E;BLOCK SEXTANT-1234;So;0;ONT;;;;;N;;;;;
1FB0F;BLOCK SEXTANT-5;So;0;ONT;;;;;N;;;;;
1FB10;BLOCK SEXTANT-15;So;0;ONT;;;;;N;;;;;
1FB11;BLOCK SEXTANT-25;So;0;ONT;;;;;N;;;;;
1FB12;BLOCK SEXTANT-125;So;0;ONT;;;;;N;;;;;
1FB13;BLOCK SEXTANT-35;So;0;ONT;;;;;N;;;;;
1FB14;BLOCK SEXTANT-235;So;0;ONT;;;;;N;;;;;
1FB15;BLOCK SEXTANT-1235;So;0;ONT;;;;;N;;;;;
1FB16;BLOCK SEXTANT-45;So;0;ONT;;;;;N;;;;;
1FB17;BLOCK SEXTANT-145;So;0;ONT;;;;;N;;;;;
1FB18;BLOCK SEXTANT-245;So;0;ONT;;;;;N;;;;;
1FB19;BLOCK SEXTANT-1245;So;0;ONT;;;;;N;;;;;
1FB1A;BLOCK SEXTANT-345;So;0;ONT;;;;;N;;;;;
1FB1B;BLOCK SEXTANT-1345;So;0;ONT;;;;;N;;;;;
1FB1C;BLOCK SEXTANT-2345;So;0;ONT;;;;;N;;;;;
1FB1D;BLOCK SEXTANT-12345;So;0;ONT;;;;;N;;;;;
1FB1E;BLOCK SEXTANT-6;So;0;ONT;;;;;N;;;;;
1FB1F;BLOCK SEXTANT-16;So;0;ONT;;;;;N;;;;;
1FB20;BLOCK SEXTANT-26;So;0;ONT;;;;;N;;;;;
1FB21;BLOCK SEXTANT-126;So;0;ONT;;;;;N;;;;;
1FB22;BLOCK SEXTANT-36;So;0;ONT;;;;;N;;;;;
1FB23;BLOCK SEXTANT-136;So;0;ONT;;;;;N;;;;;
1FB24;BLOCK SEXTANT-236;So;0;ONT;;;;;N;;;;;
1FB25;BLOCK SEXTANT-1236;So;0;ONT;;;;;N;;;;;
1FB26;BLOCK SEXTANT-46;So;0;ONT;;;;;N;;;;;
1FB27;BLOCK SEXTANT-146;So;0;ONT;;;;;N;;;;;
1FB28;BLOCK SEXTANT-246;So;0;ONT;;;;;N;;;;;
1FB29;BLOCK SEXTANT-1246;So;0;ONT;;;;;N;;;;;
1FB2A;BLOCK SEXTANT-346;So;0;ONT;;;;;N;;;;;
1FB2B;BLOCK SEXTANT-1346;So;0;ONT;;;;;N;;;;;
1FB2C;BLOCK SEXTANT-2346;So;0;ONT;;;;;N;;;;;
1FB2D;BLOCK SEXTANT-12346;So;0;ONT;;;;;N;;;;;
1FB2E;BLOCK SEXTANT-56;So;0;ONT;;;;;N;;;;;
1FB2F;BLOCK SEXTANT-156;So;0;ONT;;;;;N;;;;;
1FB30;BLOCK SEXTANT-256;So;0;ONT;;;;;N;;;;;
1FB31;BLOCK SEXTANT-1256;So;0;ONT;;;;;N;;;;;
1FB32;BLOCK SEXTANT-356;So;0;ONT;;;;;N;;;;;
1FB33;BLOCK SEXTANT-1356;So;0;ONT;;;;;N;;;;;
1FB34;BLOCK SEXTANT-2356;So;0;ONT;;;;;N;;;;;
1FB35;BLOCK SEXTANT-12356;So;0;ONT;;;;;N;;;;;
1FB36;BLOCK SEXTANT-456;So;0;ONT;;;;;N;;;;;
1FB37;BLOCK SEXTANT-1456;So;0;ONT;;;;;N;;;;;
1FB38;BLOCK SEXTANT-2456;So;0;ONT;;;;;N;;;;;
1FB39;BLOCK SEXTANT-12456;So;0;ONT;;;;;N;;;;;
1FB3A;BLOCK SEXTANT-3456;So;0;ONT;;;;;N;;;;;
1FB3B;BLOCK SEXTANT-13456;So;0;ONT;;;;;N;;;;;
1FB3C;BLOCK SEXTANT-23456;So;0;ONT;;;;;N;;;;;
1FB3D;BLOCK SEXTANT-123456;So;0;ONT;;;;;N;;;;;
1FB3E;BLOCK SEXTANT-6;So;0;ONT;;;;;N;;;;;
1FB3F;BLOCK SEXTANT-16;So;0;ONT;;;;;N;;;;;
1FB40;BLOCK SEXTANT-26;So;0;ONT;;;;;N;;;;;
1FB41;BLOCK SEXTANT-126;So;0;ONT;;;;;N;;;;;
1FB42;BLOCK SEXTANT-36;So;0;ONT;;;;;N;;;;;
1FB43;BLOCK SEXTANT-136;So;0;ONT;;;;;N;;;;;
1FB44;BLOCK SEXTANT-236;So;0;ONT;;;;;N;;;;;


Teletext Art Research Lab. 2017. [http://teletextart.co.uk/](http://teletextart.co.uk/)


15. Disclaimer. All trademarks and registered trademarks mentioned herein are the property of their respective owners. The company and product names used in this document are for identification purposes only.
**Arrows for legacy computing**

- `U+2B96` 🅷 ARROW POINTING UPWARDS THEN NORTH WEST
- `U+2B97` 🅸 ARROW POINTING RIGHTWARDS THEN CURVING SOUTH WEST
Graphics for Legacy Computing

Block elements

| 1FB5F | UPPER LEFT BLOCK DIAGONAL LOWER CENTRE TO UPPER MIDDLE RIGHT |
| 1FB60 | UPPER LEFT BLOCK DIAGONAL LOWER LEFT TO UPPER MIDDLE RIGHT |
| 1FB61 | UPPER LEFT BLOCK DIAGONAL LOWER CENTRE TO UPPE |
| 1FB62 | UPPER RIGHT BLOCK DIAGONAL UPPER CENTRE TO UPPER MIDDLE RIGHT |
| 1FB63 | UPPER RIGHT BLOCK DIAGONAL LOWER LEFT TO UPPER MIDDLE RIGHT |
| 1FB64 | UPPER RIGHT BLOCK DIAGONAL UPPER CENTRE TO LOWER MIDDLE RIGHT |
| 1FB65 | UPPER RIGHT BLOCK DIAGONAL UPPER LEFT TO LOWER MIDDLE RIGHT |
| 1FB66 | UPPER RIGHT BLOCK DIAGONAL UPPER CENTRE TO LOWER RIGHT |
| 1FB67 | UP |
| 1FB68 | LEFT AND LOWER RIGHT TRIANGULAR THREE QUARTERS BLOCK |
| 1FB69 | LEFT AND LOWER | THREE QUARTERS BLOCK |
| 1FB6A | LEFT AND LOWER THREE QUARTERS BLOCK |
| 1FB6B | LEFT AND UP | THREE QUARTERS BLOCK |
| 1FB6C | LEFT TRIANGULAR ONE QUARTER BLOCK |
| 1FB6D | UP | ONE QUARTER BLOCK |
| 1FB6E | RIG | ONE QUARTER BLOCK |
| 1FB6F | LOWER TRIANGULAR ONE QUARTER BLOCK |

Shade characters

| 1FB89 | RIGHT FIVE EIGHTHS BLOCK |
| 1FB8A | RIGHT THREE QUARTERS BLOCK |
| 1FB8B | RIGHT SEVEN EIGHTHS BLOCK |
| 1FB8C | UPPER RIGHT SEVEN EIGHTHS BLOCK |
| 1FB8D | LOWER RIGHT SEVEN EIGHTHS BLOCK |
| 1FB8E | LOWER LEFT SEVEN EIGHTHS BLOCK |
| 1FB8F | UPPER LEFT SEVEN EIGHTHS BLOCK |
| 1FB90 | LEFT ONE EIGHTH BLOCK AND RIGHT THREE QUARTERS BLOCK |
| 1FB91 | LEFT ONE QUARTER BLOCK AND RIGHT FIVE EIGHTHS BLOCK |
| 1FB92 | LEFT THREE EIGHTHS BLOCK AND RIGHT HALF BLOCK |
| 1FB93 | LEFT HALF BLOCK AND RIGHT THREE EIGHTHS BLOCK |
| 1FB94 | LEFT EIGHTHS BLOCK AND RIGHT ONE QUARTER BLOCK |
| 1FB95 | LEFT THREE QUARTERS BLOCK AND RIGHT ONE EIGHTHS BLOCK |
| 1FB96 | UPPER EIGHTHS BLOCK AND LOWER THREE QUARTERS BLOCK |
| 1FB97 | UPPER ONE QUARTER BLOCK AND LOWER FIVE EIGHTHS BLOCK |
| 1FB98 | UPPER THREE EIGHTHS BLOCK AND LOWER HALF BLOCK |
| 1FB99 | UPPER HALF BLOCK AND LOWER THREE EIGHTHS BLOCK |
| 1FB9A | UPPER FIVE EIGHTHS BLOCK AND LOWER ONE QUARTER BLOCK |
| 1FB9B | UPPER THREE QUARTERS BLOCK AND LOWER ONE EIGHTH BLOCK |

Terminal graphic characters

| 1FB9C | LEFT HALF MEDIUM SHADE |
| 1FB9D | RIGHT HALF MEDIUM SHADE |
| 1FB9E | UPPER MEDIUM SHADE |
| 1FB9F | LOWER HALF MEDIUM SHADE |
| 1FBAE | INVERSE MEDIUM SHADE |
| 1FB9F | LOWER HALF MEDIUM SHADE |
| 1FB9A | UPPER FIVE EIGHTHS BLOCK AND LOWER ONE QUARTER BLOCK |
| 1FB9B | UPPER THREE QUARTERS BLOCK AND LOWER ONE EIGHTH BLOCK |

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(Printed: 24-Apr-2018)
Dingbat
1FBAB ✗ INVERSE CHECK MARK
   → 2713 ✓ check mark

Terminal graphic characters
1FBAC ✗ INVERSE LIGHT DIAGONAL CROSS
   → 2573 ✗ box drawings light diagonal cross
1FBAD ☐ INVERSE LIGHT DIAGONAL MIDDLE RIGHT TO LOWER CENTRE
1FBAE ✗ INVERSE LIGHT DIAGONAL DIAMOND

Colored block element
1FBAF ■ BORDER-COLOURED FULL BLOCK
   → 2588 ■ full block

Character cell diagonals
1FBB0 < BOX DRAWINGS LIGHT DIAGONAL UPPER CENTRE TO MIDDLE LEFT TO LOWER CENTRE
1FBB1 > BOX DRAWINGS LIGHT DIAGONAL UPPER CENTRE TO MIDDLE RIGHT TO LOWER CENTRE
1FBB2 v BOX DRAWINGS LIGHT DIAGONAL MIDDLE LEFT TO LOWER CENTRE TO MIDDLE RIGHT
1FBB3 ^ BOX DRAWINGS LIGHT DIAGONAL MIDDLE LEFT TO UPPER CENTRE TO MIDDLE RIGHT
1FBB4 < BOX DRAWINGS LIGHT DIAGONAL UPPER CENTRE TO MIDDLE LEFT
1FBB5 > BOX DRAWINGS LIGHT DIAGONAL MIDDLE LEFT TO LOWER CENTRE TO MIDDLE RIGHT
1FBB6 v BOX DRAWINGS LIGHT DIAGONAL MIDDLE LEFT TO LOWER CENTRE
1FBB7 ^ BOX DRAWINGS LIGHT DIAGONAL MIDDLE LEFT TO LOWER CENTRE

Terminal graphic characters
1FC0 ▲ ARROWHEAD-SHAPED POINTER
1FC1 ✓ LEFT HALF RUNNING MAN
   • faces right whereas 1F3C3 �� faces left
   • Running Man is the name for these characters in documentation for the Apple II
   → 1F3C3 �� runner
1FC2 ○ RIGHT HALF RUNNING MAN

Arrows
1FC3 стрелка INVERSE DOWNWARDS ARROW WITH TIP LEFTWARDS
   → 21B2 ↫ downwards arrow with tip leftwards
1FC4 стрелка INVERSE DOWNWARDS ARROW WITH TIP LEFTWARDS
1FC5 стрелка LEFTWARDS ARROW AND UPPER AND LOWER ONE EIGHTH BLOCK
1FC6 стрелка RIGHTWARDS ARROW AND UPPER AND LOWER ONE EIGHTH BLOCK
1FC7 стрелка UPWARDS ARROW AND RIGHT ONE EIGHTH BLOCK

Terminal graphic characters
1FC8 ▿ LEFT HALF FOLDER
   → 1F4C1 ⪁ file folder
   → 1F5C0 ⪒ folder
1FC9 ▿ RIGHT HALF FOLDER
1FCA # VOIED GREEK CROSS
   → 0023 # number sign
   → 256C # box drawings double vertical and horizontal
   → 2719 ⟹ outlined greek cross
   → 271A ⟹ heavy greek cross
   → 1F7A3 ⬜ medium greek cross
1FCB 犇 RIGHT OPEN SQUARED DOT
   → 2ACE 犇 square right open box operator
1FCC ✗ TWO PAIRS OF DIAGONAL LINES CROSSING
   → 2A33 ✗ smash product
1FCD ☐ LEFT THIRD WHITE RIGHT POINTING INDEX
   → 281E ☐ white right pointing index
1FCE ☚ MIDDLE THIRD WHITE RIGHT POINTING INDEX
1FCF ☚ RIGHT THIRD WHITE RIGHT POINTING INDEX
1FDD ☚ NEGATIVE SQUARED QUESTION MARK
   → 003F ? question mark
   → FFFD ✗ replacement character
1FDE ☚ STICK FIGURE
   → 1F6B9 �� mens symbol
1FDF ☚ STICK FIGURE WITH DRESS
   → 1F6BA �� womens symbol
1FE0 ☚ WHITE UP-POINTING CHEVRON
   → 2302 △ house
   → 1F530 �� japanese symbol for beginner

Block elements
1FDB    HEAVY HORIZONTAL FILL
   = upper middle and lower one quarter block
   → 3013 □ geta mark
1FDC    INVERSE HEAVY HORIZONTAL FILL
   = upper and lower middle one quarter block

Segmented digits
1FBE stroked SEGMENTED DIGIT ZERO
   → 0030 0 digit zero
1FBF stroked SEGMENTED DIGIT ONE
   → 0031 1 digit one
1FBF stroked SEGMENTED DIGIT TWO
   → 0032 2 digit two
1FBF stroked SEGMENTED DIGIT THREE
   → 0033 3 digit three
1FBF stroked SEGMENTED DIGIT FOUR
   → 0034 4 digit four
1FBF stroked SEGMENTED DIGIT FIVE
   → 0035 5 digit five
1FBF stroked SEGMENTED DIGIT SIX
   → 0036 6 digit six
1FBF stroked SEGMENTED DIGIT SEVEN
   → 0037 7 digit seven
1FBF stroked SEGMENTED DIGIT EIGHT
   → 0038 8 digit eight
1FBF stroked SEGMENTED DIGIT NINE
   → 0039 9 digit nine
Figures.

**Figure 1.** MouseText as implemented on the Apple IIc (above, with **RUNNING MAN**) and IIgs (below, with replacement characters). (Wikipedia)

**Figure 2.** Character dump of ATASCII glyphs.

**Figure 3.** Sinclair ZX80 (left) and ZX81 (right) character dumps. (Wikipedia, CCO 1.0)
Figure 4. Atari ST glyphs, 8 pixels high (left) and 16 pixels high (right). Note 7-segment styled digits at 0x10 through 0x19 (proposed), and Atari logo at 0x0E–0x0F and J.R. “Bob” Dobbs image at 0x1C–0x1F (not proposed). (Wikipedia, CCO 1.0)

Figure 5. TI-99/4A character dump, generated by Rebecca Bettencourt using a JavaScript-based emulator, showing BORDER-COLOURED FULL BLOCK (the yellow square under the U of RUN).
Figure 6. PETSCII as displayed on the Commodore 64. Other Commodore models used slightly different versions of this set. (Wikipedia)
Figure 7. Image created on the Commodore 64 using semigraphics. Many other microcomputer platforms were, and continue to be, used to create this type of text-mode artwork.

Figure 8. Example of the use of semigraphics to plot “pixels” on the TRS-80 by displaying the appropriate $2 \times 3$ block graphic. (Wikipedia)
Figure 9. Screen shot from Ceefax, the world’s first teletext information service. Note the use of foreground and background colors, double-height text, and semigraphics.

Figure 10. A different example of the color and semigraphics capabilities of teletext. (Teletext Art Research Lab)
Figure 11. Illustration of “contiguous mode” versus “separated mode” 2 × 3 block graphics in teletext. (IBA Technical Review #2)

Figure 12. Mattel Aquarius character set. Several of the glyphs in this collection could not be identified, and hence this platform was not used as input to this proposal (except for U+1FB9D RIGHT HALF MEDIUM SHADE).
A. Administrative

1. Title
Proposal to add characters from legacy computers and teletext to the UCS

2. Requester's name
Terminals Working Group (Doug Ewell et al.)

3. Requester type (Member body/Liaison/Individual contribution)
Individual contribution.

4. Submission date
2018-04-23

5. Requester's reference (if applicable)

6. Choose one of the following:
6a. This is a complete proposal
Yes.

6b. More information will be provided later
No.

B. Technical – General

1. Choose one of the following:
1a. This proposal is for a new script (set of characters)
Yes.

1b. Proposed name of script

1c. The proposal is for addition of character(s) to an existing block
No.

1d. Name of the existing block

2. Number of characters in proposal
217.

3. Proposed category (A-Contemporary; B.1-Specialized (small collection); B.2-Specialized (large collection); C-Major extinct; D-Attested extinct; E-Minor extinct; F-Archaic Hieroglyphic or Ideographic; G-Obscure or questionable usage symbols)
Category B.1.

4a. Is a repertoire including character names provided?
Yes.

4b. If YES, are the names in accordance with the “character naming guidelines” in Annex L of P&P document?
Yes.

4c. Are the character shapes attached in a legible form suitable for review?
Yes.

5a. Who will provide the appropriate computerized font (ordered preference: True Type, or PostScript format) for publishing the standard?
Rebecca Bettencourt

5b. If available now, identify source(s) for the font (include address, e-mail, ftp-site, etc.) and indicate the tools used:
Rebecca Bettencourt, FontForge.

6a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided?
Yes.

6b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached?
Yes.

7. Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)?
Yes.

8. Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script.
See above.

C. Technical – Justification

1. Has this proposal for addition of character(s) been submitted before? If YES, explain.
Yes, in L2/17-435, the previous version of this proposal. Five of the characters were proposed by Eduardo Marin Silva in L2/17-194.

2a. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)?
Yes.

2b. If YES, with whom?
comp.sys.apple2 (Apple II newsgroup); Atari ST user community; TRS-80 user community (George Phillips).

2c. If YES, available relevant documents

3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or
publishing use) is included?

**Contemporary use by specialists and hobbyists.**
4a. The context of use for the proposed characters (type of use; common or rare)
   Rare.
   4b. Reference
5a. Are the proposed characters in current use by the user community?
   Yes.
   5b. If YES, where?

**Worldwide, but particularly in North America and Europe.**
6a. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP?
   No.
   6b. If YES, is a rationale provided?
   6c. If YES, reference
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)?
   Mostly yes, but this is not required.
8a. Can any of the proposed characters be considered a presentation form of an existing character or character sequence?
   Yes, the “7-segment” styled digits can be considered presentation forms of U+0030 through U+0039.
   8b. If YES, is a rationale for its inclusion provided?
   Yes.
   8c. If YES, reference

**Included in proposal.**
9a. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters?
   No.
   9b. If YES, is a rationale for its inclusion provided?
   9c. If YES, reference
10a. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character?
   Yes.
   10b. If YES, is a rationale for its inclusion provided?
   Yes.
   10c. If YES, reference

The proposal document describes new semigraphics which are superficially similar to existing characters.
11a. Does the proposal include use of combining characters and/or use of composite sequences (see clauses 4.12 and 4.14 in ISO/IEC 10646-1: 2000)?
   No.
   11b. If YES, is a rationale for such use provided?
   11c. If YES, reference
11d. Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided?
   11e. If YES, reference
12a. Does the proposal contain characters with any special properties such as control function or similar semantics?
   No.
   12b. If YES, describe in detail (include attachment if necessary)
13a. Does the proposal contain any Ideographic compatibility character(s)?
   No.
   13b. If YES, is the equivalent corresponding unified ideographic character(s) identified?