# Text for initial video description

The screen on the left is the Terminal display application. The picture on the right is an original Heathkit H-89 showing the screen fonts. The Load button opens a file dialog box to get the original font file. The number in the text box to the right of the Show button is the offset to a character in the font file. The asterisk in large text box represents one pixel from the font file.

The H19 button starts a new window with a bitmap image. The initialization function writes ABCDEF in the bitmap. The next letters were typed from the keyboard. Each time a character is written to the bitmap, the bitmap is saved to variable representing the bitmap. The bitmap is fixed in size and does not scale with the window frame.

The next program is the serial interface to a CP/M system. The application on the left is my application, currently using a textbox. I will integrate the bitmap solution into this application. The application on the right is Absolute Telnet used to connect to the CP/M system console via Telnet. My application is connected at 19,200 baud through a serial port. I would like my bitmap solution to scale like Absolute Telnet (expand and shrink fonts with window size)

# Design Notes 1/17/2023

Alrighty...now we're talking😎...some questions/thoughts:

0) Why is there no Debug configuration?

1) You'll have to offer more details, but C# programs are generally organized by namespace/class/members (functions and data) w/large classes (sometimes) broken across files using 'partial classes'.

2) I'm intrigued...Are you drawing each char pixel-by-pixel? As for when to update - I suspect you want a termh19\_Paint() handler. Paint is the Windows event where you Should do all your redrawing.

3) Obviously related to (2) but check out the termh19.SizeMode property. One of its five settings may help. Docking/Anchoring may also help. [c# - resizing pictureBox proportionally to Form resizing - Stack Overflow](<https://stackoverflow.com/questions/23982033/resizing-picturebox-proportionally-to-form-resizing>)

4) [ToAscii function (winuser.h) - Win32 apps | Microsoft Learn](<https://learn.microsoft.com/en-us/windows/win32/api/winuser/nf-winuser-toascii>)

5) Threading and Windows is notoriously tricky due to an ugly history that requires update to Windows Controls to be done on the 'main' thread - the one where they're created. Consider the Background Worker Component from the Toolbox instead (or at least to start/experiment). [How to: Download a File in the Background - Windows Forms .NET Framework | Microsoft Learn](<https://learn.microsoft.com/en-us/dotnet/desktop/winforms/controls/how-to-download-a-file-in-the-background?view=netframeworkdesktop-4.8>)

Let me know if this helps and what's next. If you'd like to meet, I have time during the day tomorrow if you're available.

Tutor Session Topics

* Software license: If I get ideas from code but don’t copy it, do I need to include the original license (MIT, GPL, etc?)
* Absolute Telnet demo related to copy and paste characters
* Screen updates - paint handler
* Value in creating a Terminal class and instantiating it from the main program
* Threading discussion related to two serial connections
* Recommended Font Editor? I used fontstruct to generate a font. I’m currently trying FontForge to modify the font to reduce spacing between characters
* Scaling is resolved
* ASCII conversion – I have enough information to move forward. Thanks!

# Heathkit19 Font

* Standard ASCII set
* Graphics starts with 0x100

This a test of H19 Font This Thisw

This is a test of H19 Font in Courier New

# Key Press

<https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#:~:text=The%20only%20practical%20difference%20between%20KeyDown%20and%20KeyPress,this%20sequence%20of%20events%3A%20KeyDown%3A%20KeyCode%3DKeys.A%2C%20KeyData%3DKeys.A%2C%20Modifiers%3DKeys.None>

**What is the difference between the KeyDown and KeyPress events in .NET?**

There is apparently a lot of misunderstanding about this!

The only practical difference between KeyDown and KeyPress is that KeyPress relays the character resulting from a keypress, and is only called if there is one.

In other words, if you press A on your keyboard, you'll get this sequence of events:

1. KeyDown: KeyCode=Keys.A, KeyData=Keys.A, Modifiers=Keys.None
2. KeyPress: KeyChar='a'
3. KeyUp: KeyCode=Keys.A

But if you press Shift+A, you'll get:

1. KeyDown: KeyCode=Keys.ShiftKey, KeyData=Keys.ShiftKey, Shift, Modifiers=Keys.Shift
2. KeyDown: KeyCode=Keys.A, KeyData=Keys.A | Keys.Shift, Modifiers=Keys.Shift
3. KeyPress: KeyChar='A'
4. KeyUp: KeyCode=Keys.A
5. KeyUp: KeyCode=Keys.ShiftKey

If you hold down the keys for a while, you'll get something like:

1. KeyDown: KeyCode=Keys.ShiftKey, KeyData=Keys.ShiftKey, Shift, Modifiers=Keys.Shift
2. KeyDown: KeyCode=Keys.ShiftKey, KeyData=Keys.ShiftKey, Shift, Modifiers=Keys.Shift
3. KeyDown: KeyCode=Keys.ShiftKey, KeyData=Keys.ShiftKey, Shift, Modifiers=Keys.Shift
4. KeyDown: KeyCode=Keys.ShiftKey, KeyData=Keys.ShiftKey, Shift, Modifiers=Keys.Shift
5. KeyDown: KeyCode=Keys.ShiftKey, KeyData=Keys.ShiftKey, Shift, Modifiers=Keys.Shift
6. KeyDown: KeyCode=Keys.A, KeyData=Keys.A | Keys.Shift, Modifiers=Keys.Shift
7. KeyPress: KeyChar='A'
8. KeyDown: KeyCode=Keys.A, KeyData=Keys.A | Keys.Shift, Modifiers=Keys.Shift
9. KeyPress: KeyChar='A'
10. KeyDown: KeyCode=Keys.A, KeyData=Keys.A | Keys.Shift, Modifiers=Keys.Shift
11. KeyPress: KeyChar='A'
12. KeyDown: KeyCode=Keys.A, KeyData=Keys.A | Keys.Shift, Modifiers=Keys.Shift
13. KeyPress: KeyChar='A'
14. KeyDown: KeyCode=Keys.A, KeyData=Keys.A | Keys.Shift, Modifiers=Keys.Shift
15. KeyPress: KeyChar='A'
16. KeyUp: KeyCode=Keys.A
17. KeyUp: KeyCode=Keys.ShiftKey

Notice that KeyPress occurs in between KeyDown and KeyUp, **not** after KeyUp, as many of the other answers have stated, that KeyPress is not called when a character isn't generated, and that KeyDown is repeated while the key is held down, also contrary to many of the other answers.

Examples of keys that do **not** directly result in calls to KeyPress:

* Shift, Ctrl, Alt
* F1 through F12
* Arrow keys

Examples of keys that **do** result in calls to KeyPress:

* A through Z, 0 through 9, etc.
* Spacebar
* Tab (KeyChar='\t', ASCII 9)
* Enter (KeyChar='\r', ASCII 13)
* Esc (KeyChar='\x1b', ASCII 27)
* Backspace (KeyChar='\b', ASCII 8)

For the curious, KeyDown roughly correlates to WM\_KEYDOWN, KeyPress to WM\_CHAR, and KeyUp to WM\_KEYUP. WM\_KEYDOWN can be called fewer than the the number of key repeats, but it sends a repeat count, which, IIRC, WinForms uses to generate exactly one KeyDown per repeat.

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answered Sep 2, 2009 at 13:58

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* 2

Excellent explanation, thx, one caveat though, Escape does not trigger KeyPress on Chrome (not sure about the others).

– [Barney Szabolcs](https://stackoverflow.com/users/1031191/barney-szabolcs)

[Apr 29, 2013 at 16:54](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment23306998_1367865)

* 3

@BarnabasSzabolcs: Chrome runs .NET?

– [P Daddy](https://stackoverflow.com/users/36388/p-daddy)

[Apr 30, 2013 at 23:33](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment23353867_1367865)

* @PDaddy ups, I've overlooked, I've thought it was javascript :D but with slightly weird style :P nevertheless, it appears the rules are quite similar :DD ... funnily enough this answer helped me a lot anyway... cheers :)

– [Barney Szabolcs](https://stackoverflow.com/users/1031191/barney-szabolcs)

[May 1, 2013 at 16:41](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment23373755_1367865)

* @PDaddy I know that at least Tab doesnt fire KeyDown or KeyUp by default

– [PsychoData](https://stackoverflow.com/users/2238544/psychodata" \o "1,138 reputation)

[Mar 6, 2014 at 17:09](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment33757071_1367865)

* @PsychoData: That's because the Tab key changes focus, so it's not processed as input. If you override ProcessDialogKey and return false when keyData is Keys.Tab or Keys.Shift | Keys.Tab, then you'll see the Tab key in (On)Key(Down|Press|Up).

– [P Daddy](https://stackoverflow.com/users/36388/p-daddy)

[Mar 7, 2014 at 20:32](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment33810303_1367865)

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79

The KeyPress event is not raised by noncharacter keys; however, the noncharacter keys do raise the KeyDown and KeyUp events.

<https://learn.microsoft.com/en-us/dotnet/api/system.windows.forms.control.keypress>

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answered Sep 2, 2009 at 13:34

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* 18

Most of the other answers are wrong in one way or another, but this one comes closest to the reality. KeyPress is raised only for character keys and it obeys the setting of keyboard typing delays/repeating. The actual sequence of events is: 1) KeyDown 2) for character key KeyPress one or more times (depending on the system settings and how long the key is held) 3) KeyUp

– [Filip Navara](https://stackoverflow.com/users/156063/filip-navara)

[Sep 2, 2009 at 13:42](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment1205891_1367720)

* I don't have the rep to do it, but could someone bust a wiki and combine the content of the above comment and the accepted answer?

– [Josh Kodroff](https://stackoverflow.com/users/549/josh-kodroff)

[Sep 2, 2009 at 13:46](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment1205922_1367720)

* 12

Filip Navara's comment isn't entirely correct. If a key is held down, you'll get KeyDown, KeyPress, KeyDown, KeyPress, KeyDown, KeyPress KeyUp. KeyDown is called for every repeat.

– [P Daddy](https://stackoverflow.com/users/36388/p-daddy)

[Sep 2, 2009 at 13:55](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment1205990_1367720)

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9

KeyPress is only fired by printable characters and is fired after the KeyDown event. Depending on the typing delay settings there can be multiple KeyDown and KeyPress events but only one KeyUp event.

KeyDown  
KeyPress  
KeyUp

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answered Sep 2, 2009 at 13:39

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[stevehipwell](https://stackoverflow.com/users/89075/stevehipwell)

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* You're close, but off about the sequence.

– [P Daddy](https://stackoverflow.com/users/36388/p-daddy)

[Sep 2, 2009 at 13:48](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment1205946_1367741)

* @P Daddy - I've corrected it, should have double checked before going from memory.

– [stevehipwell](https://stackoverflow.com/users/89075/stevehipwell" \o "54,848 reputation)

[Sep 2, 2009 at 14:07](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment1206058_1367741)

* @Stevo3000, fyi: non-printable unicode characters will also fire KeyPress events. I have an app that reads data inserted by a barcode reader into a textbox and the reader includes non-printable unicode characters.

– [Jeff LaFay](https://stackoverflow.com/users/179386/jeff-lafay)

[Feb 7, 2013 at 18:35](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment20656141_1367741)

* @jlafay - Not according to [MSDN](http://msdn.microsoft.com/en-gb/library/system.windows.forms.control.keypress(v=vs.110).aspx) *The KeyPress event is not raised by noncharacter keys; however, the noncharacter keys do raise the KeyDown and KeyUp events.*

– [stevehipwell](https://stackoverflow.com/users/89075/stevehipwell" \o "54,848 reputation)

[Feb 11, 2013 at 8:09](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment20741046_1367741)

* @Stevo3000, I'm not sure how the barcode scanner inputs text into a textbox but the KeyPress fires for special characters that it sends. The value starts with a non-printable character and terminates with a non-printable character. So I'm not sure how it's firing if that's true. Maybe I'll take a look at the .Net assembly that contains the events with IL Spy to get a better look at what is actually detected.

– [Jeff LaFay](https://stackoverflow.com/users/179386/jeff-lafay)

[Feb 11, 2013 at 13:53](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment20749329_1367741)

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5

KeyPress is a higher level of abstraction than KeyDown (and KeyUp). KeyDown and KeyUp are hardware related: the actual action of a key on the keyboard. KeyPress is more "I received a character from the keyboard".

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answered Sep 2, 2009 at 13:43

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4

Keydown is pressing the key without releasing it, Keypress is a complete press-and-release cycle.

Put another way, KeyDown + KeyUp = Keypress

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answered Sep 2, 2009 at 13:33

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according to MSDN, the event sequence is KeyDown, KeyPress, KeyUp ([msdn.microsoft.com/en-us/library/…](http://msdn.microsoft.com/en-us/library/system.windows.forms.control.keypress(VS.71).aspx))

– [Nathan Koop](https://stackoverflow.com/users/18821/nathan-koop)

[Sep 2, 2009 at 13:35](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment1205857_1367711)

* @RobCowell Also, as jlafay pointed out KeyPress isnt at all dependant on KeyDown or KeyUp.

– [PsychoData](https://stackoverflow.com/users/2238544/psychodata" \o "1,138 reputation)

[Mar 7, 2014 at 22:31](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment33814062_1367711)

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4

From MSDN:

Key events occur in the following order:

1. [KeyDown](http://msdn.microsoft.com/en-us/library/system.windows.forms.control.keydown.aspx)
2. [KeyPress](http://msdn.microsoft.com/en-us/library/system.windows.forms.control.keypress.aspx)
3. [KeyUp](http://msdn.microsoft.com/en-us/library/system.windows.forms.control.keyup.aspx)

Furthermore, KeyPress gives you a chance to declare the action as "[handled](http://msdn.microsoft.com/en-us/library/system.windows.forms.keypresseventargs.handled.aspx)" to prevent it from doing anything.

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* FYI, KeyDown and KeyUp also have a Handled property that you may set so that isn't a between KeyPress and the other key events.

– [Jeff LaFay](https://stackoverflow.com/users/179386/jeff-lafay)

[Feb 7, 2013 at 18:39](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment20656291_1367723)

* FWIW although KeyUp, like KeyDown, gets a KeyEventArgs parameter its Handled property is inoperative for KeyUp (SuppressKeyPress is also inoperative).

– [JonP](https://stackoverflow.com/users/5523794/jonp" \o "617 reputation)

[Oct 10, 2016 at 9:23](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment67189826_1367723)

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3

I've always thought keydown happened as soon as you press the key down, keypress is the action of pressing the key and releasing it.

I found this which gives a little different explanation: <http://bytes.com/topic/net/answers/649131-difference-keypress-keydown-event>

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answered Sep 2, 2009 at 13:32

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2

From [Blogging Developer](http://www.bloggingdeveloper.com/post/KeyPress-KeyDown-KeyUp-The-Difference-Between-Javascript-Key-Events.aspx):

In order to understand the difference between keydown and keypress, it is useful to understand the difference between a **"character"** and a **"key"**. A **"key"** is a physical button on the computer's keyboard while a **"character"** is a symbol typed by pressing a button. In theory, the keydown and keyup events represent **keys** being pressed or released, while the keypress event represents a **character** being typed. The implementation of the theory is not same in all browsers.

**Note:** You can also try out the Key Event Tester (available on the above-mentioned site) to understand this concept.

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answered Apr 17, 2017 at 15:00

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* Link in answer is dead.

– [Pang](https://stackoverflow.com/users/1402846/pang)

[Nov 27, 2020 at 0:27](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment114969033_43453946)

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1

KEYUP will be captured only once, upon release of the key pressed, regardless of how long will the key be held down, so if you want to capture such press only once, KEYUP is the suitable event to capture.

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* The KeyPress event is raised for every character generated from input, both in response to physical key presses as well as when the character is the result of the autorepeat feature. [How Keyboard Input Works](https://learn.microsoft.com/en-us/dotnet/framework/winforms/how-keyboard-input-works) documents this behavior.

– [IInspectable](https://stackoverflow.com/users/1889329/iinspectable" \o "44,443 reputation)

[Jan 10, 2018 at 20:47](https://stackoverflow.com/questions/1367700/whats-the-difference-between-keydown-and-keypress-in-net#comment83372551_48169999)