

**User Guide**

**Using the Dot Pad 320 with VoiceOver**

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## Introduction of VoiceOver & Dot Pad 320

VoiceOver is an advanced screen reader integrated into the Apple OS, designed to assist visually impaired users by providing auditory and tactile feedback.

When paired with Dot Pad 320, VoiceOver delivers tactile feedback for both text and graphics, creating a comprehensive and intuitive accessibility solution.

This synergy empowers visually impaired users to interact with their devices more effectively and productively.

The Dot Pad 320 enhances this experience by offering real-time braille output, similar to other braille displays, but with the added advantage of displaying multiple lines of braille simultaneously. This feature enables users to read large amounts of screen content more efficiently. The multi-line braille preview mode allows users to quickly and effectively understand the screen layout, revolutionizing productivity for screen reader users.

Furthermore, the Dot Pad can instantly display on-screen images as tactile graphics.

Users can zoom in and out or invert these images for detailed reading and scroll horizontally or vertically to explore large images thoroughly. Additionally, some applications allow users to perceive graphs tactilely on the Dot Pad, enhancing the overall accessibility experience.

### Feature Overview

When connected to Apple VoiceOver, the Dot Pad offers the following features:

Note:

Features specified with an OS name in parentheses are exclusive to that OS. Features without an OS name are available across all Apple operating systems.

* **Single-Line Braille Output:**

The VoiceOver content is displayed in real-time as braille on the single-line braille

display of the Dot Pad 320.

* **Multi-Line Braille Output (iOS & iPadOS):**

Displays screen content in multi-line braille, allowing the use of preview mode and

other features with the multi-line braille display of the Dot Pad 320.

* **Real-Time Tactile Image Display:**

When the VoiceOver cursor focuses on a specific object on the screen, the corresponding image is displayed on the Dot Pad.

* **Tactile Image Display Using VoiceOver Recognition:**

Activating VoiceOver Recognition provides a description of the focused object or surrounding screen images in both audio and braille text, and simultaneously

displays the images tactilely on the Dot Pad.

* **Graph Display:**

Some applications, such as stock apps, can display graphs tactilely on the Dot Pad alongside with audio graphs (Sonification).

* **VoiceOver Control and Shortcut Key Modification Using Dot Pad Buttons:**

Interact with VoiceOver using the buttons on the Dot Pad, which can also be customized to perform specific VoiceOver commands.

### System Requirements

The Dot Pad is compatible with VoiceOver on the following Apple operating systems:

* iOS 15.2 and later
* iPadOS 15.2 and later
* macOS 13.3 and later
* VisionOS 1.0 and later

## Using the Dot Pad 320 with iOS & iPad OS

### Feature Overview

In iOS and iPadOS, you can read screen content through VoiceOver on the Dot Pad as you would with any other braille display. Starting from iOS & iPadOS 18.0, users can utilize the multi-line braille output feature as well as read images and graphs tactilely.

### System Requirements

Minimum Requirements: iPhone and iPad capable of running iOS or iPadOS 15.2 or later.

For Multi-Line Braille Output: iPhone and iPad capable of running iOS or iPadOS 18 or later.

### Connecting the Dot Pad 320 to VoiceOver

Here are the steps to connect the Dot Pad to your iPhone or iPad:

1. Turn on VoiceOver.
2. Go to [Settings] > [Accessibility] > [VoiceOver] > [Braille]
3. Check the Bluetooth device name of your Dot Pad and find the matching device in the list of devices displayed at the bottom of the screen connect it.
4. When the Dot Pad vibrates and you hear the specific beep indicating that a braille device has been connected in VoiceOver, the connection is successful. And the LED light on the Dot Pad will turn blue.

Note:

To disconnect the connected Dot Pad from VoiceOver, press and hold the connected device or use the Actions menu in the VoiceOver rotor to select More, then tap Forget This Device. The Dot Pad will be disconnected.

### Reading Content with Single-Line Braille Display

When VoiceOver and the Dot Pad 320 are successfully connected, the available functions that display the content on the Dot Pad 320 will depend on the iOS or iPadOS version you are using.

* iOS or iPadOS versions before 18.0:
The VoiceOver content will be displayed in real-time on the single-line braille display of the Dot Pad.
* iOS or iPadOS version 18.0 and above:
The content will be displayed on both the multi-line and single-line braille displays of the Dot Pad 320, allowing for more extensive content to be read simultaneously.

In single-line braille display, users can scroll through the content by lines:

* Left panning key (left triangular button): scroll to the previous line.
* Right panning key (right triangular button): scroll to the next line.

### Reading Content with Multi-Line Braille Display

When VoiceOver and the Dot Pad are connected, users can simultaneously read screen content in multi-line braille. Multi-line braille offers the advantage of quickly and accurately reading large amounts of screen content. Additionally, the preview mode in multi-line braille output allows users to understand the screen layout more efficiently compared to traditional screen readers.

VoiceOver’s multi-line braille output feature provides four different modes to display screen content. These options can be adjusted in the VoiceOver Rotor under “Braille Text Mode.” The four options are as follows:

* Braille Text Mode > Reading Mode:
This is the default option for multi-line braille output. It displays text in the multi-line braille display if text is present and displays images if they are present.
* Braille Text Mode > Reading Mode (No Images):
This option ignores images and displays only text in the multi-line braille area.
* Braille Text Mode > Preview Mode:
This mode provides a brief list of items on the screen starting from the current position.
* Braille Text Mode > Images:
This option outputs only images and graphs in the multi-line braille area, excluding text.

By using these modes, users can customize their digital experience to best suit their needs, enhancing productivity and accessibility.

#### Basic Multi-Line Braille Output Mode (Braille Text mode > Reading Mode)

Reading Mode is the default option for displaying either braille text or graphics flexibly on the multi-line braille display, depending on the context. When the user focuses on an image or a graph, it is tactilely represented on the multi-line braille display and when the user focuses on text, up to eight lines of braille can be displayed.

When braille text is displayed, it appears starting from the topmost line, with the currently focused item at the top. Additionally, to indicate that it is the first item, a cell with all dots from 1 to 8 filled is displayed before the screen content.

To scroll through the multi-line braille display, use the F1 and F4 keys on the Dot Pad.

The single-line braille display is synchronized with the multi-line display.

#### Image Skipping Mode (Braille Text Mode - Reading Mode (No Images))

When the Reading Mode (No Images) option is selected in the Braille Text Mode Rotor, VoiceOver will not print graphical information even if the cursor is positioned on images or graphs. Instead, the multi-line braille display will show alternative text of the images, the name of the image control, or the name of the graph. This allows users to focus solely on text content while still recognizing the presence of images and graphs through alternative descriptions.

#### Quick Screen Navigation Mode (preview mode)

Preview Mode arranges the screen items sequentially on the multi-line braille display, starting from the current focus position. The Dot Pad can display up to eight screen items simultaneously, with each item’s text limited to 20 braille characters. If an item’s length exceeds 20 characters, the text after the 20th character will be omitted.

To read the summarized screen items in detail, read the single-line braille display. For example, to read the currently focused item on the first line in detail, press the right Panning key to explore the full content of the focused screen item.

#### Image Viewing Mode (Images)

When the Images option is selected, the Dot Pad operates similarly to how it does on iOS or iPadOS versions lower than 18.0. In this mode, the multi-line braille display will not show braille text. Instead, it will exclusively display images and graphs. For more detailed information on viewing screen images on the Dot Pad, please refer to section <2.6. Viewing Screen Images on the Dot Pad>.

### Displaying Screen Images on the Dot Pad 320

#### Basic Image Output Setup

When VoiceOver focuses on an object containing image information, It is displayed on the Dot Pad 320 tactilely.

Steps:

1. Ensure that the Dot Pad 320 is connected to your device and navigate to the Home Screen.
2. Use VoiceOver to move the focus to any application icon on the Home Screen.
3. The 300-cell graphic display on the Dot Pad will display the shape of the application icon. And the VoiceOver content will be displayed on the 20-cell of the Dot Pad 320 in braille.

By following these steps, users can easily perceive and interact with graphical information on their devices using the Dot Pad 320 with VoiceOver.

#### Zooming In/Out on images

VoiceOver allows you to zoom in or out on images displayed tactilely on the Dot Pad 320. This feature helps you read the details of an image more precisely. To use this feature, add the “Braille Zoom” option to your Rotor settings. Follow these steps to zoom images:

Steps:

1. Place the VoiceOver cursor on the image you want to zoom in or out.
2. Rotate two fingers on the screen (clockwise or anticlockwise) to select “Braille Zoom” from the Rotor.
3. Swipe one finger down to zoom in on the image. Swipe one finger up to zoom out on the image.
4. The zoom level ranges from 0% to 100%.
5. The Dot Pad 320 will refresh immediately to be updated with the zoom changes.

By following these steps, users can easily adjust the image size on the Dot Pad to enhance your tactile reading experience.

#### Scrolling Through Images

When images are zoomed in, they might be larger than the display area of the Dot Pad 320. In such cases, users can use the image scrolling function to navigate through the enlarged image. Both horizontal and vertical scrolling are supported. To enable this feature, add “Braille Vertical Pan” and “Braille Horizontal Pan” to your Rotor settings. Follow these steps to scroll images:

Steps:

1. Place the VoiceOver cursor on any image object (e.g., application icon or image).
2. Horizontal Scrolling:
* Set the Rotor to “Braille Horizontal Pan”.
* Swipe one finger down to scroll the tactile graphic to the left.
* Swipe one finger up to scroll the tactile graphic to the right.
1. Vertical Scrolling:
* Set the Rotor to “Braille Vertical Pan”.
* Swipe one finger down to scroll the tactile graphic upwards.
* Swipe one finger up to scroll the tactile graphic downwards.

By following these steps, users can navigate through the entire image even when it is larger than the Dot Pad 320’s display area, ensuring you can access all parts of the zoomed-in image effectively

#### Inverting Images

This feature allows users to convert the outlines of tactile images from raised to inverted, aiding in better understanding the image. Here’s how to use the image inversion feature:

1. Place the VoiceOver cursor on any image object (e.g., application icon or image).
2. Ensure the image is displayed on the Dot Pad 320’s graphic area.
3. Set the Rotor to the “Invert braille” option.
4. Swipe down with one finger to execute the inversion. The image on the Dot Pad 320 will switch from raised to inverted.
5. To revert the image back to its standard mode, set the Rotor to the “Invert braille” option again.
6. Swipe up with one finger to deactivate the inversion, returning the image to its original raised state.

#### Reading Images on the Dot Pad 320 with VoiceOver Recognition

Even if VoiceOver doesn’t initially recognize an object as an image, you can leverage the AI capabilities in iOS and iPadOS 14 and above to gather image information.

This analyzed image data is then conveyed via audio description and displayed on the Dot Pad 320 as tactile graphics and braille.

To use VoiceOver Recognition, users need to configure a custom gesture for the manual VoiceOver Recognition command. Please follow these steps:

1. Go to [Settings] > [Accessibility] > [VoiceOver] > [VoiceOver Recognition].
2. Ensure the Image Descriptions toggle is switched on. If not, double tap the toggle to turn it on.
3. The necessary data for image descriptions will download.
4. Once the download is complete, use a back gesture or the back button to return to the VoiceOver settings.
5. Go to [Commands] > [Touch Gestures] and select Desired touch gesture in VoiceOver gestures list. Find and add Image Descriptions.
6. With this custom gesture set up, users can now use it to trigger AI-based image descriptions anywhere on the screen.

After setup, VoiceOver will then provide descriptions of the focused object or the surrounding screen area, displaying the information as tactile graphics on the Dot Pad.

### Reading Graphs

Users can view stock graphs on the Dot Pad 320 using a stock application by following these steps:

1. Launch the stock application on your device.
2. Choose the stock you would like to analyze.
3. Move the VoiceOver focus to the area displaying stock graph.
4. The stock graph will appear on the Dot Pad 320, allowing you to read the graph tactilely.

### Dot Pad Shortcut List in iOS & iPadOS

Here are the default VoiceOver commands that can be used with the keys on the Dot Pad:

Table 1Default VoiceOver Commands with the Dot Pad 320 buttons.

|  |  |  |
| --- | --- | --- |
| Name | Key | Description |
| Single-Line Braille Display Left Pan | Left Pan Key | Scrolls the single-line braille display to the previous line. |
| Multi-Line Braille Display Left Pan | F1 Key | Scrolls the multi-line braille display to the previous unit. |
| Move to Home | F2 Key | Moves to the home screen. |
| Activate Selected Item | F3 Key | Activates the currently focused item (equivalent to a double tap with one finger). |
| Multi-Line Braille Display Right Pan | F4 Key | Scrolls the multi-line braille display to the next unit. |
| Single-Line Braille Display Right Pan | Right Pan Key | Scrolls the single-line braille display to the next line |
| Move to the Previous Item | Left Pan + F1 Key | Moves to the previous item from the current position (equivalent to a left swipe with one finger). |
| Move to the Next Item | Right Pan + F4 Key | Moves to the next item from the current position (equivalent to a right swipe with one finger). |
| Move to the First Item | F1 + F2 Keys | Moves to the first element on the screen (equivalent to a four-finger tap at the top of the screen). |
| Move to the Last Item | F3 + F4 Keys | Moves to the last element on the screen (equivalent to a four-finger tap at the bottom of the screen). |

These commands enable users to effectively navigate and interact with their devices using the Dot Pad in conjunction with VoiceOver.

### Modifying Dot Pad Shortcuts

Users can customize the panning keys and function keys on the Dot Pad 320 to match their own preferences. For example, you can change the F1 key from navigating to the previous item to toggling the screen curtain. Here’s how to do it:

1. With the Dot Pad connected, go to [Settings] > [Accessibility] > [VoiceOver] > [Braille].
2. Find and focus on “DPA320A xxxx (the unique Bluetooth name of your device)”.
3. Adjust the Rotor option to Actions. The default Rotor option is set to Actions.
4. Swipe up/down with one finger to find [More Info], then double tap to select it.
5. Locate and execute the [Braille Commands] button to display the list of command categories.
6. Select the desired category from [Braille], [Device], [Interaction], [Keyboard], [Navigation], [Rotor], and [VoiceOver].
7. In this document, select [Navigation] as an example.
Go to [Navigation] > [Move to Next Paragraph] > [Assign New Braille Key].
8. When the key input pop-up appears, press the Dot Pad function key you want to assign to the Move to Next Paragraph function.
9. In this document, modify the F2 key as an example.
10. When user presses the F2 button, a warning message will appear stating that the F2 key is already in use.
11. To override and reassign the key, execute the [Assign New Braille Key] button.
12. Now, the F2 key will function to move to the previous paragraph.
13. To retain the original key assignment, use the VoiceOver back gesture to exit the warning pop-up.

## Using the Dot Pad with macOS

This section provides a comprehensive guide on connecting and using the Dot Pad with macOS VoiceOver. Before proceeding, please familiarize yourself with the following key terms:

* VO Key:
This term refers to the modifier key combination used for executing VoiceOver commands. The VO Key can be the Control Key + Option Key or the Caps Lock Key.
* VoiceOver Utility:
This is a sub-menu within the Accessibility settings where you can manage all VoiceOver settings.
* Groups and Hierarchy:
macOS VoiceOver organizes on-screen objects into a hierarchical structure. For example, in the Mail application, to locate buttons like New Mail and Delete, you must navigate within the toolbar hierarchy. Similarly, tables are presented as upper-level structures, and to read the contents of individual cells, you must delve into the table’s lower hierarchy. This hierarchical organization follows the tree structure defined by SwiftUI or UIKit.

Understanding these terms will help you navigate and use the features of the Dot Pad more effectively with macOS VoiceOver.

### Feature Overview

In macOS, Users can read screen content through VoiceOver on the Dot Pad just like any other braille display. Additionally, users can read images and graphs tactilely. This is particularly helpful for tasks such as viewing images on web pages or understanding slide layouts in Apple Keynote or Microsoft PowerPoint. It also aids in identifying broken and non-broken tables by interacting with screen readers and tables.

### System Requirements

* macOS 13.3 and later
* Preferably a Mac computer with Apple Silicon
* A Mac computer that supports Bluetooth devices

### Connecting the Dot Pad to VoiceOver

Here are the Steps to Connect Dot Pad to macOS VoiceOver

1. Launch the VoiceOver Utility by pressing VO Key + F8.
2. Navigate to the Braille category.
3. Select the Displays tab.
4. Turn on your Dot Pad.
5. Click the Add button to open a window for scanning nearby braille displays.
6. If your Dot Pad has entered Bluetooth pairing mode correctly, its Bluetooth name will appear in the list of devices.
7. Focus the cursor on it using the Tab key, trackpad, or by navigating into the sub-group and select the connect button.
8. If the connection is successful, you will receive vibration feedback on the Dot Pad.
9. Click the Select button to register the Dot Pad as a braille display.
10. Upon successful connection, VoiceOver will emit a beep sound indicating the braille display is connected. The screen content read by VoiceOver will start displaying in braille on the single-line area of the Dot Pad.

### Reading Screens with Single-Line Braille Display

When VoiceOver and the Dot Pad are successfully connected, the single-line braille display will show the screen content read by VoiceOver in real-time. You can scroll through the content line by line. Use the left triangle button on the Dot Pad, known as the left pan key, to scroll to the previous line. Similarly, use the right triangle button, known as the right pan key, to scroll to the next line

### Displaying Screen Images on the Dot Pad

#### Basic Image Output Settings

When VoiceOver focuses on an object containing image information, that image is displayed on the Dot Pad.

* Navigate to the Dock while the Dot Pad is connected.
* Focus on any application in the Dock menu.
* Alternatively, open a web page and focus on any image within the page.

The graphic area of the Dot Pad will display the application icon or image, while the text area will display the content read by VoiceOver in braille.

#### Zooming In/Out on Images

On macOS, unlike iOS or iPadOS, you cannot use the Rotor to zoom in or out on images. Instead, you must create a shortcut key for zooming. For instructions on creating these shortcuts, refer to <3.7. Creating VoiceOver Shortcuts for Dot Pad>.

* Position the VoiceOver cursor on the image you want to zoom in on.
* Press the shortcut key assigned to the “Zoom in” function to enlarge the image.
* To reduce the size of the zoomed-in image, press the shortcut key assigned to the “Zoom out” function.
* The zoom range is from 0% to 100%.
* As the image is zoomed in or out, it will be immediately refreshed on the Dot Pad.

#### Scrolling Through Images

The concept of scrolling images on the Dot Pad in macOS is similar to iOS or iPadOS. However, it requires assigning specific shortcut keys for scrolling, as it cannot be adjusted using the Rotor. You will need shortcut keys for all four directions: Move Down, Move Left, Move Right, and Move Up. When you scroll the image in the desired direction, the image displayed on the Dot Pad will move accordingly.

* Assign shortcuts for Move Down, Move Left, Move Right, and Move Up.
* Use these shortcuts to scroll the image in the respective directions on the Dot Pad.

#### Inverting Images

The inverting images feature in macOS operates similarly to its counterparts in iOS and iPadOS. However, macOS requires you to create specific shortcut keys rather than using the Rotor. By selecting the toggle invert function, you can switch between inverted mode and the standard image display mode.

#### Reading Images on the Dot Pad with Voiceover Recognition

To use VoiceOver Recognition in macOS, the default shortcut key is VO + Shift + “L”. Follow these steps to use it:

* Focus on the screen element for which you want to hear an image description or view the tactile image.
* Press VO + Shift + “L”.
* An image description will be provided, and the image will be displayed on the Dot Pad.

These steps ensure users the full capabilities of VoiceOver and Dot Pad for both standard and advanced image handling, enhancing the overall accessibility experience.

### Dot Pad Shortcut List in macOS

Here are the shortcuts users can use to control VoiceOver on the Dot Pad while using macOS:

|  |  |  |
| --- | --- | --- |
| Name | Key | Description |
| Single-Line Braille Display Left Pan | Left Pan Key | Scrolls the single-line braille display to the previous line. |
| Move to the Previous Item | F1 Key | Moves the VoiceOver cursor to the previous item from the currently focused item (Equivalent to QuickNav On mode left arrow key or VO + left arrow key). |
| Dock Menu | F2 Key | Moves to the Dock menu (Equivalent to VO + d key). |
| Activate Selected Item | F3 Key | Activates the item currently under the VoiceOver cursor (Equivalent to QuickNav On mode down arrow key + up arrow key or VO + Space key). |
| Move to the Next Item | F4 Key | Moves the VoiceOver cursor to the next item from the currently focused item (Equivalent to QuickNav On mode right arrow key or VO + right arrow key). |
| Single-Line Braille Display Right Pan | Right Pan Key | Scrolls the single-line braille display to the next line. |

### Creating VoiceOver Shortcuts for the Dot Pad 320

To utilize functions like image enlargement, scrolling, and inversion with Dot Pad on macOS, you need to create custom shortcuts. Follow these steps:

1. Press VO + F8 to open the VoiceOver Utility.
2. Select Commands from the category list.
3. In the Command Set group, choose the User Custom radio button.
4. Click the Edit button.
5. Click Add to create a new empty command set.
6. Navigate to the Command Assignments table.
7. Click the added none popup button to expand the modifier key group options. Choose from Option Key, Quick Nav keys, NumPad, or Trackpad.
8. Specify values from a to z or 0 to 9 within the chosen group.
9. Open the Command Actions popup menu, find and expand the 2D Braille category.
10. Select the desired Dot Pad function from the list.
11. Click the Done button to complete the assignment.

Now, pressing the specified shortcut will enable detailed image reading on the Dot Pad.

### Modifying Dot Pad Shortcuts in VoiceOver

Users can modify the default VoiceOver commands assigned to Dot Pad keys. Here’s how:

1. Press VO + F8 to open the VoiceOver Utility.
2. Select the Braille category.
3. Click the Displays tab.
4. Select Dot Pad from the braille display list and click the Assign Commands button.
5. In the Braille Commands table, click the Action button next to the Dot Pad key you want to modify (e.g., F2 key).
6. Find and select the desired VoiceOver function from the relevant category.
7. Click the Done button to complete the key modification.

To assign new functions to empty keys without changing the default Dot Pad key assignments, Please follow these steps:

1. Press VO + F8 to open the VoiceOver Utility.
2. Select the Braille category.
3. Follow the procedures outlined above to create and assign new command actions to empty key values.

These instructions will help you customize the Dot Pad for a more tailored and efficient use with macOS VoiceOver.