



GRAPHITI PLUS – User Manual

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1 Introduction

Graphiti Plus is a tactile graphic display. It is used either in a standalone mode or by connecting to a PC through utility. Graphiti Plus allows you to draw, save and review pre-stored images and text files from the device or PC and has the following features:

1. 60 horizontal and 40 vertical pins to display that can be transformed to accurately represent graphics/images
2. A line of 40 braille cells with pins that arrange into the required pattern to accurately represent any six or eight-dot braille code, in any language, and for any discipline
3. Reads the graphical and textual content of files on an SD™ (Secure Digital) card in the Stand-Alone Mode
4. Remote connectivity to PCs and mobile devices for use with a host application

2 How the Graphiti Plus Is Used

2.1 Stand-Alone Mode

Graphical and textual content stored on an SD card is read in one of the two ways:

1. Copied from PC to the device.
2. Created on the device and stored on the SD card.

In Stand-Alone mode, Graphiti Plus displays the graphical and textual contents of files, stored on an SD card.

2.2 Remote Mode

Connect the device to a computer and then do one of the following:

1. Browse the files on the PC application to see on the device
2. Create images or text files and store on the SD card of the device

The screen reader helps you to create and see the graphics as per your choice.

3 Features

Graphiti Plus has the following features:

1. 2400 pins tactile display
2. 40 Cell Braille display
3. Eight Input keys and a Space bar
4. Navigation pad with four directional buttons (Up, Down, Left, Right) and the Select button
5. SD card slot
6. Bluetooth® wireless technology
7. HDMI port
8. USB port

- 9. User-replaceable, rechargeable battery
- 10. Power Status LED

4 Orientation

Orientation of buttons, keys, cells, and slots is important for understanding how the device operates and how you input and receive information on the device.

To begin with, place the device on a flat surface in front of you with the keypad closest to you. This is the proper operational orientation.

On top surface of the unit, closest to you are the user keys (space bar and DOT keys). Further away from you is the braille display panel composed of 40 cells. Moving further away are cursor routing keys followed by the tactile display panel, composed of an array of 40 dots horizontally and 60 dots vertically. To the left of the keypad there is one LED, which indicate power and status of the device.



On the front vertical face of the unit, closest to you, from left to right, is an SD-card slot.



On the right vertical face of the unit, from front to back, are the USB Type C connector, audio jack, device ON/OFF button and the power jack.

On the left vertical face of the unit, from front to back, are USB-host connector and micro-USB connector.

On the right bottom surface of the unit, closest to you, is a slider switch which connects and disconnects the battery. Before turning on the device, move the slider switch towards you.

Please note: HDMI connector is on the back vertical face of the device.

The device can be used either by connecting to a host device or in the standalone mode for reviewing the images.

It supports the following operations in both remote and standalone modes.

1. Navigation through images and text files
2. Zoom in and Zoom out operations on images
3. Panning through zoomed image
4. Rotate image
5. Invert image color
6. Selection of different image processing algorithm variants
7. Support for different image file types:
 1. *.bmp
 2. *.jpg
 3. *.png
 4. *.gif
 5. *.tiff
 6. *.svg
8. Support for pdf files.
9. Support for customized csv files.
10. Ability to display input image properties
11. Image editing
12. Text and BRF file reading
13. Text and BRF file editing

Image and text files can be reviewed from the host using one of the following interfaces:

1. USB
2. Bluetooth (Not supported in the current release)
3. HDMI

Alternatively, image and text files can also be reviewed in standalone mode from the SD card and/or USB stick.

5 User Interfaces

Inputs can be given to the system through the following interfaces:

1. Device Keypad

2. Touch panel
3. USB
4. HDMI
5. Bluetooth (not supported in the current release)
6. External Storage Media (SD Card and USB Drive)
7. PC keyboard

5.1 Device Keypad

Moving towards the top and near to you, you can find a wider key in the middle, which is the Space bar, further away you can find a row of eight keys, with navigation pad in the middle. The navigation pad contains four directional arrow buttons (Up, Down, Left, Right) and the Select button.

The eight traditional braille input keys are aligned horizontally above the space bar and below the display, Dots 3 2 1 7 on the left and Dots 4 5 6 8 on the right.

In short, the keypad layout is as shown in the figure below.

	DOT 3	DOT 2	DOT 1	UP	DOT 4	DOT 5	DOT 6	
DOT 7	LEFT			SELECT	RIGHT			DOT 8
	DOWN							
				SPACE/CHORD				

5.2 Touch Panel

The touch panel provides control and navigation inputs for performing various operations in local as well as in remote mode.

Draw mode allows you to create a new image or edit an existing one. Refer to [Touch feature](#) for more details.

5.3 USB

There are two USB ports in Graphiti Plus, one for the USB host and the other for the USB device functionality.

Graphiti Plus supports USB classes as shown below:

In Host mode, Mass storage class and

In Device mode

1. HID
2. Serial (VCP)
3. Mass-storage class

You can connect the USB stick to the unit's host port and the PC to the USB device port.

The driver installation in a host PC is necessary in USB serial mode. If Graphiti Plus is connected to the internet enabled PC, it will automatically install the device driver. Automatic driver installation is however, recommended. You can also refer “Graphiti Serial (VCP) Driver Installation Guide” for installing the driver manually.

5.4 HDMI

A standard HDMI socket allows connection to any HDMI source, such as a computer, using commonly available HDMI cables. In HDMI mode, operations like zoom, navigate, edit, etc. can be performed on the captured image. For more information, refer [HDMI](#) section.

5.5 External Storage Media (SD Card and USB Drive)

The device supports SD cards and USB drives for the storage media. Both, SD card and USB is shown as two separate storage drives in file manager, when inserted in the device. You can perform operations like cut, copy, paste, rename, image editing and reviewing and navigation among the files and folders.

In addition, the device supports file search operations. Type the initial letters of the file name for the device to automatically start searching the files starting with those letters in the current directory. The default language for any file and folder name is English (US).

Graphiti Plus uses standard full-size SD cards from 4GB to 32GB in capacity. The card must be formatted as FAT32. There is no way to format a card on the device. Most cards come already formatted. However, you can format one as FAT32 on a desktop computer for use with Graphiti Plus.

5.5.1 Error Handling

The device shows all error messages in the message bar.

1. If there is no SD card or USB drive inserted, the device shows, "no storage media".
2. If there are no files on the SD card/USB drive, the device shows "no files".
3. If there is an error in reading the storage device, the device shows "storage media err xx", where xx is the error number.

When a storage media is removed from the device, any ongoing activity (such as reading/editing/copying etc.) gets cancelled immediately and the device displays drive removal message.

5.6 PC keyboard

Once the device is connected with the user GUI, the navigation controls provided in utility can also be operated using keys on the PC keyboard. A few keys share dual functionality, which can be activated under certain conditions. For example, the up/down arrow keys are used to scroll through image list as well as navigate the pan window after applying the zoom function on the image.

Note that the PC utility needs to be active in order to use PC keyboard with the device.

6 Powering ON and OFF

To power On the device, follow the steps mentioned below.

1. Ensure that the position of slider switch on the bottom surface of the device is towards you.
2. Press the power button for two seconds. The device will emit a single long vibration pulse. Note that if system was turned off forcefully (by pressing the power button for 10 seconds), the device will emit a small vibration pulse first before giving long vibration pulse.
3. The unit emits vibration pulses once in every two seconds while the device initializes. You may observe a pause after few vibration pulses.
4. On the Braille display panel, all cells go up and then down, followed by the braille message as “Booting...” till the Graphiti Plus unit is in ready state.
5. Once initialized, again the device will emit a single long vibration pulse. The red LED will turn green indicating that the device is ready for use. The braille display will show a braille message as “Ready...”.

By default, the operating mode of the Graphiti Plus is set as “**Local mode**” always on start up. Once Local mode is enabled properly, the tactile as well as braille display will show “[SD_Card]”.

Now device is ready for its normal operations

To power Off the device, follow the steps mentioned below.

The device can be turned off by pressing the power button for 2 seconds. On pressing the power button, the device

1. Emits two short vibrations
2. Displays “shutting down” message for 5 seconds and then disappears. (Please note, the power off time is 15-20 seconds after the message disappears.)
3. Sets all the pins on the display to home position (below the surface).

The unit emits vibration pulse once every two seconds while powering off. You may observe a pause after few vibration pulses. After the device is shut down completely, it again gives two short vibrations and turns off the green LED.

The unit will enter the ghost mode if the charger is plugged in, and you turn off the device. In this case LED turns red. During Ghost mode, the device will automatically shut down once it is fully charged or if the charger is removed.

Pressing the power off key for 10 seconds will turn off the device forcefully.

To save battery charge you can move the slider switch on the bottom surface of the device away from you to disconnect the battery if the device is not in use for a longer time.

6.1 Reset

Following are the ways to reset or turn off the system.

To...	Do this on the Device
Reboot System (Up to unit -11)	Press and hold the Down Arrow key and tap the Dot 8 key
Reboot System (Unit -12 and later units)	Press and hold the Dot 8 key and tap the Power button
Turn Off the System Forcefully	Press Power key for 10 seconds

6.2 LED and Vibration indications for various user actions

The following table captures details of vibration indications, LED status and device status for various user actions.

#	Action	Vibration indications	Final LED Status	Final Device Status
1	Press power button for 2 seconds to power on the device	A Long pulse followed by small vibration pulses every two seconds. You may observe a pause after a few vibration pulses. It generates a long pulse as the device boot completes.	Green	Powered On
2	Press power button for 2 seconds to power off the device	Two small vibration pulses repeated every two seconds.	Off (If charger is not connected) or Red (if the charger is connected)	Powered off (if charger is not connected) or Ghost charging mode (if charger is connected)
3	Tap the power button to put device to sleep	A small vibration pulse	Red	Sleep State
4	Tap the power button to wakeup device from sleep	A long vibration pulse followed by small vibration pulses every two seconds	Green	Powered On

5	Insert the charger when device is off	A small vibration pulse	Red	Device enters into Ghost charging mode
6	Insert or remove charger when device is in sleep state	A long vibration pulse followed by small vibration pulses every two seconds. It generates a long vibration pulse as device wakeup sequence completes	Green	Device exits sleep state and turns on
7	Remove Charger when device is in Ghost charging mode	Small pulses every two seconds	Off	Device turns off

7 Charging the Device

To charge the device, plug the power cord into the power jack. The display shows the message "charger connected" or "charger unplugged" with a single short vibration pulse, when the charger is connected or unplugged, respectively.

Note: The device shows these messages only when it is On. If the device is OFF when the charger is connected or disconnected, then the device will emit a single short vibration and will show charging indication by Red LED. The device can be used while charging.

7.1 Battery

The power percentage can be checked from the Menu. The Menu will show "battery xx%", where xx is the percentage number. It shows "charging xx%" when the unit is charging and "low battery", when the battery is low. Press Dot 7 to exit the Menu.

When the battery reduces to 10%, the device will emit a single long vibration pulse once in every minute to indicate low battery. Also, the last two dots of the 40th row on the display blinks on and off. This behavior is normal for indicating low battery. If the battery gets to 0% and the charger is not plugged, it gives two long vibration pulses and turns off.

Note:

1. If the device battery is fully drained, it will take nearly 12 minutes to turn on after the charger is connected.
2. The unit can be used with battery power.

8 Message Bar

By default, all the local messages and System messages appears on the braille display.

Note: - In Local SD card mode, the messages such as file names menu items, Charger indications etc., will reflect on the tactile display as well.

In other modes (i.e., HDMI, USB Serial USB HID etc.), Pressing SPACE +DOT3 will enable/disable the tactile display's message bar for showing messages.

By default, the entire graphics display area is used for displaying graphics. However, if there are any system messages to be shown, the top four rows of the tactile display become the message bar. You can change the message bar placement to bottom of the display area (bottom four rows) from the preference menu.

The message bar will show messages like file or folder name, information and error messages and is active for only 15 seconds. For instance, when you open a file, the device shows the file name on the message bar and the image is displayed in the remaining area of the display. After 15 seconds, the device automatically hides the message bar, and the contents are shown on the entire display.

Note:

1. The messages will be shown in the computer braille code.
2. The system messages will be in small letter only. The file/image name will be displayed as it is.
3. You can enable/disable the message bar and change its timeout value from the preference menu.
4. Shortcut key to enable/disable the message bar is Space + Dot 3.

There are some messages which can be cleared by pressing Dot 7 only. These messages are:

1. charger connected/ unplugged
2. HDMI cable inserted/ unplugged
3. usb drive inserted/ removed
4. SD card inserted/ removed
5. upgrade successful/ timeout

9 Vibration Indication

Graphiti Plus has vibration indications for different scenarios as per the table below. The unit will give tone indications along with vibration indication.

User Scenario	Mode/Sub Mode	Vibration Indication
Device Power On	Power On	Single long vibration
Device Power Off	NA	Two short vibrations

Entering sleep mode	Sleep Mode	Single short vibration
Exiting sleep mode	Sleep Mode	Single long vibration
Entering any sub-mode (like Draw, Erase, Review, Gesture Mode)	Remote/Local	Single short vibration
Exiting any sub-mode	Remote/Local	Two short vibrations
Change in device mode	Remote/Local	Single short vibration
Change in image	Local	Single short vibration
File saving Indication	Remote/Local	Single short vibration
File saving error	Remote/Local	Single long vibration
SD card insertion error	Remote/Local	Single long vibration
File navigation limits	Remote/Local	Two short vibrations
Canvas block extension or Navigation limit	Draw Mode	Single long vibration
Charger insertion/removal	Remote/Local/Power Off	Single short vibration
Battery status is 10% or less	Remote/Local	Single long vibration once in a minute
Battery status is 0%	Remote/Local	Two long vibrations (shutdown indication)
Device internal error	Remote/Local	Two short vibrations followed by long vibration once in every 5 seconds

10 Preference Menu

The preference menu is used to view and update the device settings. For example, you can switch to different operating modes, enable or disable the message bar and so on.

10.1 Key controls for the preference menu

Key controls for the preference menu are as shown in the table below.

#	Key	Key Function
1	Space + Dots 7 8	Open menu
2	Up arrow	Move to the previous menu item
3	Down arrow	Move to the next menu item
4	Left arrow	Left scrolling in case there are more characters on the left side
5	Right arrow	Right scrolling in case there are more characters on the right side
6	Select	Select the item

7	Dot 7	Exit the menu
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10.2 Menu items

The following table shows the menu and sub-menu items.

#	Item name	Choices	Resulting message display (If not selected / If selected)	Description
1	battery status	NA	battery: xx% or charging: xx%	Device will show battery status like “Battery: 80%” without charger and “Charging: 80%” with charger.
2	firmware version	NA	xx.xx.xx.xxxx	The current software version is xx.xx.xx.xxxxxx
3	reset defaults	NA	NA	Resets settings to default and shows first menu item
4	serial number	NA	MB xx xx xxxxx	The current unit serial number is MB xx xx xxxxx
5	usb	serial (default)	serial / <u>serial</u>	USB mode “Serial” selected
		hid	hid / <u>hid</u>	USB mode “HID” selected
6	mode	stand-alone (default)	stand-alone / <u>stand-alone</u>	Enables local mode
		usb	usb / <u>usb</u>	Enables last HID/Serial remote mode.
		hdmi	hdmi / <u>hdmi</u>	Enables remote mode for HDMI interface
		mass storage	mass storage / <u>mass storage</u>	Activates the device as a mass storage device
7	message bar status	five seconds	five seconds / <u>five seconds</u>	Displays message and auto hides after 5 seconds
		ten seconds	ten seconds / <u>ten seconds</u>	Displays message and auto hides after 10 seconds
		fifteen seconds (default)	fifteen seconds / <u>fifteen seconds</u>	Displays message and auto hides after 15 seconds
		auto hide off	auto hide off / <u>auto hide off</u>	Disables auto hide message bar
		disable	disable/ <u>disable</u>	Disables the message bar
8	message bar position	top (default)	top / <u>top</u>	Displays message bar on top of the panel

		bottom	bottom / <u>bottom</u>	Displays message bar at the bottom of the panel
9	display config-sleep	keep display	keep display / <u>keep display</u>	Keeps contents as it is on the device display in sleep.
		clear display (default)	clear display / <u>clear display</u>	Clears display at the time of sleep.
10	hdmi frame rate	one second (default)	one second / <u>one second</u>	Shows HDMI frame after every 1 second in HDMI mode.
		five seconds	five seconds / <u>five seconds</u>	Shows HDMI frame after every 5 seconds in HDMI mode.
		ten seconds	ten seconds / <u>ten seconds</u>	Shows HDMI frame after every 10 seconds in HDMI mode.
		fifteen seconds	fifteen seconds / <u>fifteen seconds</u>	Shows HDMI frame after every 15 seconds in HDMI mode.
11	hdmi frame resolution	640x480 (default)	640x480 / <u>640x480</u>	Sets the HDMI frame resolution to 640x480
		720x480	720x480 / <u>720x480</u>	Sets the HDMI frame resolution to 720x480
		800x600	800x600 / <u>800x600</u>	Sets the HDMI frame resolution to 800x600
		1024x768	1024x768 / <u>1024x768</u>	Sets the HDMI frame resolution to 1024x768
		1280x720	1280x720 / <u>1280x720</u>	Sets the HDMI frame resolution to 1280x720
12	tone indication	enable	enable / <u>enable</u>	Enables the tone indication (Supported in A0008 and later units)
		disable (default)	disable / <u>disable</u>	Disables the tone indication (Supported in A0008 and later units)
13	clock configuration	date	<u>dd-mm-yyyy</u> / <u>dd-mm-yyyy</u> / <u>dd-mm-yyyy</u>	Allows you to modify the date
		time	<u>hh:mm:ss</u> / <u>hh:mm:ss</u> / <u>hh:mm:ss</u>	Allows you to modify the time
14	slideshow interval	one second	one second / <u>one second</u>	Shows new image after every 1 second in Slideshow mode.
		five seconds (default)	five seconds / <u>five seconds</u>	Shows new image after every 5 seconds in Slideshow mode.
		ten seconds	ten seconds / <u>ten seconds</u>	Shows new image after every 10 seconds in Slideshow mode.
		fifteen seconds	fifteen seconds / <u>fifteen seconds</u>	Shows new image after every 15 seconds in Slideshow mode.

15	file sorting options	name (default)	name / <u>name</u>	Files in the file list are sorted in alphabetical order
		date	date / <u>date</u>	Files in the file list are sorted as per their last modified date
		size	size / <u>size</u>	Files in the file list are sorted based on their size
		last	last / <u>last</u>	Files in the file list are sorted based on the last time they were accessed
		ascend (default)	name ascend / <u>name ascend</u>	Arranges files from first to last. This option applies to Name, Date, Size and Last options.
		descend	name descend / <u>name descend</u>	Arranges files from last to first. This option applies to Name, Date, Size and Last options.

General notes:

1. The device clears the display on entering the preference menu.
2. By default, the Menu shows the first menu item on the message bar.
3. Pressing [Select] over an already selected item will not make any changes to it.
4. It is not possible to deselect an item. You need to select another option.
5. On exiting the menu, device will return to file manager, file review or remote mode depending on your last activity.
6. Currently selected menu item is indicated by an underline (with dot 7 and dot 8 raised).
7. Pressing Up/Down Arrows or Select button will not function on the menu items having no sub-items such as, software version.
8. On scrolling beyond the first or last menu item, the list rolls over.
9. The device will switch to the selected mode as soon as the menu item is selected.

11 Clock Configuration

Graphiti Plus has the clock configuration which helps to configure date and time of the device through the preference menu. It can also be configured using the Graphiti standard API explained in the API command document.

Select the 'date' option in the preference menu to check the present device date. It will be displayed in DD-MM-YYYY format, with the cursor set on DD. Similarly, on selecting the 'time' option, the device displays the present device time in HH:MM:SS format with cursor set on HH. To modify the date and time, use the Arrow keys of the device keypad. To set the date and time, press 'Select' key to apply the changes or dot 7 key to discard the changes.

The device supports 24hrs format for time and year ranges from 2015 to 2037. The device gives a long vibration pulse in case of invalid configuration.

12 Touch Features

The touch panel provides control and navigation inputs for performing various operations in local mode as well as in remote mode.

For the touch interface, you can select one of the two sub-modes as mentioned below:

1. Gesture
2. Draw

12.1 Touch Gestures

By default, the device is in review mode. Press Space + g (Dots 1 2 4 5) key combination to enable the gesture mode. Press the same key combination again to disable it and enable the review mode to review the updated image on the panel.

The gestures supported by the device is broadly categorized as follows:

1. Single finger swipe in four directions (Up, Down, Left and Right)
2. Double taps

While viewing images, use gestures to navigate within the image (for zoomed view of the image) or navigate to the next/previous image. Double tap to move the location of a zoomed image to the center of the device display.

Note: Gestures are not supported in draw mode.

12.2 Draw feature

Draw mode helps to create a new image or edit an existing one. Draw mode can be enabled by pressing Space + Dot 1. Drawing is performed using the touch interface of the unit.

Graphiti Plus allows to switch between the Draw and Review mode any time, for reviewing the drawn patterns. Refer section [‘Reviewing Drawings’](#) for more information on Reviewing Mode.

Note: Draw mode is not allowed when the device is in mass-storage mode. In such a case, pressing Space + Dot 1 will give a single long vibration.

Following are the key controls in draw feature:

Description	Key	Additional Information
Enter or Exit from Draw Mode	Space + Dot 1	To enter or exit draw mode
Create new image	Space + n (Dots 1 3 4 5)	To create a new drawing using Space + n

Enable or Disable Erase	Dot 5	To erase a particular pixel(s) on the panel
Enable or Disable Review Mode	Dot 6	To enable or disable review mode using this key. Disabling the review mode, re-enables the draw mode.
Erase entire image	Dot 7	To erase the entire image by using this key. The device will ask for your confirmation. Press Dot 8 to confirm and Dot 7 to cancel erase.
Save File (Full image)	Space + s (Dots 2 3 4)	To save the entire drawing on the SD card.
Save File (Screenshot)	Space + S (Dots 2 3 4 7)	To save 40 x 60 image only. This feature is not available for CSV file.
Height Level 1	Dot 1	Selects pixel height level 1 for draw mode
Height Level 2	Dot 2	Selects pixel height level 2 for draw mode
Height Level 3	Dot 3	Selects pixel height level 3 for draw mode
Height Level 4	Dot 4	Selects pixel height level 4 for draw mode

When the draw mode is enabled, pins are raised at points of the display where touch input is detected. The height of the pin raised is determined by the height level adjusted by you using the key controls described in the table above. Default pin height is level 4 (maximum). In order to adjust the height of an already raised pin, select the desired height level using key controls (Dot 1/Dot 2/Dot 3/Dot 4) and touch the pins of which the height is to be altered.

To reflect the current drawing of the display on the Graphiti PC application in real time, connect the application through either USB or Bluetooth. This feature is basically useful for a person to observe what a visually impaired person is drawing. For instance, a teacher observing what a student is drawing.

12.2.1 Erasing

To enable the Erase mode from the Draw mode press Dot 5. When the erase mode is enabled, pins are set to their down positions at the points of display panel where touch input is detected. This feature makes the corrections in the drawing. To disable the erase mode and go back to draw mode, press Dot 5 again.

To clear the contents of the entire display, press Dot 7. A “confirm action” message is displayed on the device. Press Dot 8 to confirm and erase the entire image or Dot 7 to cancel the action and continue drawing.

Note: Confirming the erase by pressing Dot 8 will lower down all the pins to their bottom-most positions.

12.2.2 Saving drawings

To save the Drawings in the current directory of the SD card / USB Drive, press SPACE + S (Dots 2 3 4) key combinations.

To save the currently displayed part of the image only (i.e., 40x60 screenshot), press SPACE + S (Dots 2 3 4 7) key combinations. The device will show an edit box in the message bar with the default file name. To rename the file name using the braille keys, navigate through the file names using Left and Right Arrow keys. To discard the file saving, press Dot 7 + Select keys.

Note: Once the edit box is enabled, only the file name can be entered. The device will not respond to any key commands. For example, if Dot 2 is pressed, the device will show '1' in the edit box instead of zooming the image.

After renaming the file, press Select key to save the image file and go back to the last sub-mode of the draw mode.

Note:

1. If the file is not renamed, it will be saved with the default name "NewImage_x.bmp". If the default file name already exists, then the device will automatically append the appropriate number to file name. For example, "NewImage_1.bmp".
2. The device will save images in the BMP file format only.
3. In order to save a drawing to the PC, use the option available on the PC GUI "Save to PC".

12.2.3 Automatic File Saving

1. Graphiti Plus automatically saves the last edited drawing in following instances:
 1. When exiting the drawing mode
 2. When directly switching the device mode from draw mode
 3. When powering off the device from draw mode
 4. When creating a new drawing.
2. Editing the already exiting file, the file will be saved as an autosaved file. For instance, "map(autosave).bmp".
3. Creating a new drawing will have the default name as "NewImage(autosave).bmp".
4. The device will automatically append the number in the file name while autosaving the new file, if the file name exists.
5. The device will always copy original file at first place and then the drawing will be saved in the new file only.
6. If you have already saved the file, the device will continue autosaving in that file only.
7. By default, the autosaved file will be saved only in the "Autosaved" directory at root directory of the SD card. If the SD card is not present, then the file be saved in the USB drive if attached.

The indications while automatic saving is as below:

Scenario	Message
Automatically file saving	“Saving please wait.” (With blinking dot)

12.2.4 Reviewing drawings

Press Dot 6 to enable the review mode to review the drawing patterns during or after drawing operations. This locks the display and disables touch input. After reviewing, press Dot 6 again to go back to the draw mode.

12.2.5 Creating a new image

To create a new image, enable the draw mode using keys SPACE + Dots 1 3 4 5 (space + n). The device provides blank display for new drawing.

Note: The new image will be created in local mode only with either SD card or USB drive inserted in the device.

12.2.6 Modifying existing images

Existing files can be edited from the storage media of Graphiti Plus. In order to do so, first open a file that requires editing and then enable the draw mode to edit the file. Save the edited file in the storage media or on the PC as described above. The device saves the modified image as a separate new file, keeping the original source file unchanged.

12.2.7 User Indication during drawing

In draw mode, the device hides the message bar automatically. On exiting draw mode, the device displays the messages automatically if the message bar is not disabled.

In draw mode, the device gives vibration indication as shown in the table below.

User Scenario	Vibration Indication
Entering draw mode	Single short vibration
Exiting draw mode	Two short vibrations
Change in pin height level using Dot 1/2/3/4	Single short vibration
Entering erase mode	Single short vibration
Exiting erase mode	Two short vibrations
Entering review mode	Single short vibration
Exiting review mode	Two short vibrations
Erase full drawing	Single short vibration
If you try to enter in draw mode when the device is in mass storage mode	Single long vibration

12.2.8 Canvas

The Canvas feature of Graphiti Plus helps you to extend the drawing beyond the existing array size (40 rows x 60 columns) for a newly created image or extend beyond the original image size in an existing image.

Canvas can be extended by a single line or group of lines in any direction (left, right, above or below) using the appropriate keys. Canvas drawing up to 25 Mega pixels can be created.

On exiting draw mode, all operations like zooming, rotating, inverting etc. can be performed on the image made by the canvas drawing as explained in the [‘Reviewing Images’](#) section.

12.2.8.1 Extending Image Size

Graphiti Plus provides an option of extending the image size. For example, if you wish to extend the boundaries of the current drawing as shown below in Figure 1, press the hot key sequence (e.g., Space + Right key). This will add 60 columns on the right side of the current drawing and the extended image becomes 40x120 as shown below in Figure 2. Similarly, if 40 rows are added in the downward direction, then the final resolution of the drawing becomes 80x120 as shown below in Figure 3.

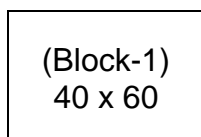


Figure-1: 40x60 Resolution

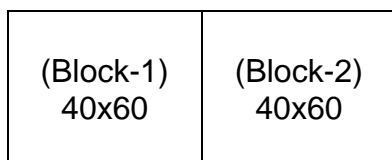


Figure-2: 40x120 Resolution

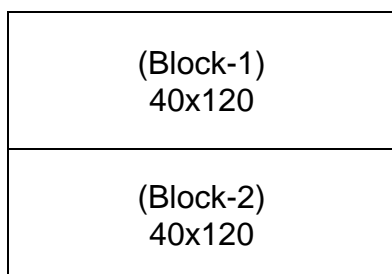


Figure-3: 80x120 Resolution

The following key controls are available for the canvas feature:

Description	Key
-------------	-----

Add a single row canvas to the top side (after the navigation limit) / Jump to an already existing upper row	Up
Add a single row canvas to the bottom side (after navigation limit) / Jump to already existing lower row	Down
Add a single column canvas to the right side (after navigation limit) / Jump to already existing right column.	Right
Add a single column canvas to the left side (after navigation limit) / Jump to already existing column	Left
Add a canvas block to the upper side of the current block (after navigation limit) / Jump to already existing upper block	Space + Up
Add a canvas block to the lower side of the current block (after navigation limit) / Jump to already existing lower block	Space + Down
Add a canvas block to the right side of current block (after navigation limit) / Jump to already existing right block	Space + Right
Add a canvas block to the left side of the current block (after navigation limit) / Jump to already existing left block	Space + Left

Canvas drawing can be added at any zoom level. Once the navigation limit is reached (for example left side), the device will give a long vibration indication. By pressing arrow key or space + arrow keys once again, the device will add 1 line or a block canvas on the left side.

If the image resolution is less than 40x60, (say for example if the image resolution is 10x10), then the image will be displayed at the center of the device display. Drawing outside the 10x10 area will add the canvas automatically. If a single horizontal line is drawn 5 rows above the 10x10 image, the device will add a canvas automatically and the resultant image resolution will be 15 (rows) x 10 (columns).

12.2.8.2 Canvas Block Size:

The size of the canvas block changes depending on the resolution of the image and the zoom level at the time of canvas drawing.

For example, if you are interested in extending the 1000x1000 (Rows x Columns) image at maximum zoom level, adding one canvas block at the top of the image will change the image resolution to 1040x1000. Similarly, if a canvas block is added on the right side of the image, then the image size will become 1000x1060. This means that it will add either 40 rows or 60 columns as the case might be.

But, when a canvas block is added to an image that is not zoomed and is in default view mode, adding one canvas block on the top side of the image will change the image resolution to 2000x1000 (Rows x Columns). Similarly, if a canvas block is added to the right side of the image, then the image size will

become 1000x2500 (Rows x Columns). This means it will add 1000 rows or 1500 columns.

12.2.8.3 User Notification:

The device gives indications during canvas drawing as shown in the table below.

The device will emit	If
Single short vibration pulse	Canvas block or row or column added successfully.
Long vibration pulse	There is insufficient memory.
Single short vibration pulse once every 2 seconds.	The device is saving the current drawing.

General notes:

1. Canvas drawing can be added in draw mode only.
2. After adding a canvas in default view (i.e., zoom out max), the device considers the final resolution of the image and then resizes it to 60x40 to fit in the display.
3. The device reads and edits standard image files with resolution up to (X) * (Y) = 25 megapixels. Here, X and Y resolution can be set to any number but the total number of pixels (X * Y) should not be more than 25 megapixels. Please refer to some of the examples below for different resolutions,
 1. 5000 x 5000
 2. 3000 x 3000
 3. 1000 x 9000
 4. 2000 x 4000
 5. 5000 x 1800
4. A canvas block can be added at any zoom level but for a better view of the image, it is recommended that you add the canvas block only after applying maximum zooming.

12.3 Undo Redo Feature

To perform undo and redo operations on the drawing, press Space + Dots 1 3 5 6 (z) and Space + Dots 1 3 4 5 6 (y) key combinations, respectively.

Graphiti Plus can undo last 15 pixels of the drawing 10 times. It retains the last pixel state in undo. For example, if you draw a pattern with pixel height 4 and change the pattern with pixel height 3 and then perform the undo operation, the device will reset the pixel height of the last 15 pixels to 4.

The Redo operation can be done after the undo operation has been executed at least once. In the above example, if Redo is performed after Undo is applied, then the device will set the last 15 pixels height back to height 3.

These operations can also be performed while reviewing the drawing in draw mode.

13 Remote Operations

The Graphiti Plus unit can be connected to remote devices like PC using the USB, or HDMI interfaces. However, the unit needs to be put in the appropriate interface mode before connecting to remote devices.

For USB operations, select one of the following modes:

1. USB Serial Mode
2. USB HID Mode
3. USB Mass Storage Mode

Press Space + Dot 7 to select USB HID mode or Space + Dot 8 to select VCP/Serial mode. Keep the unit in HDMI mode for HDMI operations and in Bluetooth mode for Bluetooth operations.

For USB Serial, USB HID and Bluetooth, Graphiti Plus requires an application running on the host device to communicate with it using standard Graphiti APIs. Graphiti Plus acts as a mass storage media when mass storage mode is selected using the Space + Dot 5.

The HDMI interface does not require any application. In this mode, Graphiti Plus works as a display monitor device.

13.1 GUI (PC utility)

GUI helps to browse the images and review it by zooming and panning. You can draw on the GUI and review it on the device. There are many user-friendly features like for instance, sending the image file to the device using the command window etc.

For Graphiti PC application interface, select any one of the communication modes in Graphiti Plus as mentioned below:

1. USB Serial Mode (Space + Dot 8)
2. USB HID Mode (Space + Dot 7)
3. Bluetooth (Space + Dot 4)

Please refer Graphiti PC Application User Manual vx.x.pdf for more details.

13.2 HDMI

13.2.1 Interface and Resolution

Any HDMI source (with HDMI v1.4 and later) can be connected to Graphiti Plus system through an HDMI cable.

Graphiti Plus captures the HDMI frame in the following resolution.

1. 640 x 480 (VGA) (Default)
2. 720 x 480
3. 800 x 600 (SVGA)
4. 1024 x 768 (XGA)

5. 1280 x 720 (HD 720)

The default resolution is 640 x 480 that can be changed from the preference menu. If the selected resolution is 640 x 480 then the device will act as 640 x 480 (VGA) display. Similarly, if the selected resolution is 800 x 600 then the device will act as 800 x 600 (SVGA) display.

Note: It is possible that some of the HDMI source (Laptop or any other device) will not support lower resolutions. In such case, try higher side resolution i.e., 800 x 600 or above.

13.2.2 Configuration

Following are the steps to configure HDMI to work with Windows machine.

1. First connect Graphiti Plus to the host using HDMI cable and press SPACE + Dot 6 for HDMI mode.
2. For windows PC, go to Advanced display settings → Multiple displays → Duplicate these display and press apply button.
3. In most of the cases, the host will change its screen resolution to VGA automatically, but if it is not changing the monitor resolution, then you can set it manually from Display setting → Device adaptor properties → Adaptor setting → List All modes → and select VGA resolution

Note: The host configuration mentioned above is required only for the first time or unless you change it for different options.

13.2.3 HDMI Mode

Graphiti Plus shows a video with configurable frame rates. Enable the HDMI mode by pressing Space + Dots 6 keys and set the frame rate from one frame per second to one frame every 15 seconds from the preference menu.

The device shows “HDMI mode” and will start capturing the frame automatically. In case the device is not connected with HDMI source, it doesn't show any error message.

13.2.4 Review HDMI Frame

By default, the device shows down-sampled images (60x40 resolution) on the tactile display. To apply different types of image processing algorithms on the captured frame, press Select key. For better viewing, use the keys for zoom in, zoom out, invert and rotate the captured frame. For more details, refer [Reviewing Images](#).

After zooming, panning can be done through the arrow keys. You can also use swipe gesture for panning after zoom. To activate/deactivate the Gesture mode, press Space + g (Dots 1 2 4 5) key combination.

To view a 60x40 pixel portion of the captured frame, zoom it to a maximum level using Select + Dot 4 key, and navigate through the frame using the arrow keys available on the device keypad.

The device maintains the zoom level, filters and panning location unless you change it. This helps to view similar types of images.

To edit or modify the captured frame, refer the '[Draw Feature](#)' section.

To save the image on the SD card, press Space + Dots 2 3 4 or Space + Dots 2 3 4 7 keys. Please refer section "[Saving drawings](#)" for more details about the key commands.

Limitations:

1. The system does not process audio from HDMI source.
2. The system does not support the CEC (consumer electronics control) channel.
3. For HDMI video, if the frame rate is less than 5 seconds, then the device updates the display without displaying the previous frame completely.

13.2.5 Access the PC through the touch Panel of the Graphiti Plus in HDMI mode

By connecting the micro-B USB cable between Graphiti Plus and PC while in HDMI mode lets you access the PC screen through touch panel of the Graphiti Plus by touching on the tactile display.

Tapping (or double tap) on any area of the Graphic display panel results into the tap (or double tap) operation on the connected windows machine.

Moving finger over the touch panel does not translate into any actions.

Press Dot 6 to enable/disable the review-only mode. When enabled, touch inputs are not transmitted to the host machine.

13.2.6 Display the Text information from the Host machine on the braille display of Graphiti Plus

Connecting the Type C USB cable between Graphiti Plus and the PC lets you use the Graphiti Plus Braille display panel as text display screen for the screen readers. Please follow the steps as below to use this feature.

1. Connecting the Type C USB cable between Graphiti Plus and the PC
2. The Braille display will show a braille message as "Screen reader port plugged"
3. Open the NVDA screen reader application on Laptop
4. Go to Preference → Settings... → Braille
5. In the Braille, display options select the BAUM/APH/Orbit Reader displays option
6. Click on Apply button and then the Ok button
7. The textual information will start to replicate on the braille display

8. The speech support provided by NVDA will announce the text information

You can use this configuration to Read and Editing the Text, Word, PPT, Excel documents on PC in HDMI mode.

Once connected with NVDA, the keys are by default transmitted to NVDA.

If you wish to perform some local key operations such as opening menu or changing the device operating mode, you can switch to the local mode of the keys by doing a long press on the select key. You can toggle back to the remote operations of the keys by doing a long press on the select key again.

Once connected with NVDA, the Braille display panel shows both, the system messages as well as the messages coming from NVDA.

If required, you can configure it to show either only system messages or only external messages. Refer to the following table for details

Configuration	Key Press
Enable/Disable show Local Display messages Only	Long Press Dot 1
Enable/Disable show Screen reader Display messages only	Long press Dot 2
Enable/Disable show Local and Screen reader display messages both	Long Press Dot 3

13.3 Mass Storage

Graphiti Plus acts as a mass storage device when mass storage mode is selected using Space + Dot 5.

When the device is attached to the PC in mass storage mode, files and folders can be copied from/to the device.

Here, the SD card content will be displayed on the PC and provide alternate option to SD card reader for accessing files and folders of the SD card.

13.4 API

It is possible for third parties to create applications on any computing platform (computers, mobile devices, Raspberry Pi boards, etc.) to communicate with Graphiti Plus, using its standard API. The complete API is described in a separate document.

The API allows sending image data to the device and receiving the following data from the device:

1. General information
2. Device display information
3. Keypad information
4. Touch information

There are two ways to send image data to the device:

1. *Send an already processed image*
Here the application converts each pixel of an actual image into different height levels (height level 0 to 4) before sending the raw pixel data to the device.
2. *Send the original image file, e.g., BMP, PNG, etc.*
In this method, the application directly sends a supported image file to the device for display.

14 Standalone Operation

In this mode, the device accesses images from external storage media such as, SD card and/or USB drive.

The device shows external storage media in form of the directory. If both, the SD card and USB drive are present, the device shows two main directories. Refer [“External Storage Media \(SD card and USB drive\)”](#) for more details on SD and USB drive.

To invoke the Standalone mode, press Space + Dot 2 key combination. Once entered, all features related to standalone mode will be enabled. In standalone mode, the device supports all standard image types as mentioned previously.

14.1 File Manager Commands

The following file management operations are available in standalone mode.

Description	Device Keypad	Touch Panel	Additional Information
Open a file or folder	Select	Not Available	Press [Select] key to open the file or folder. If it is file, then contents will be displayed on tactile display. Message bar on tactile display shows the file name.
Go to previous file or folder	Up Arrow	Down Swipe	To go to previous file or folder in the current directory.
Go to next file or folder	Down Arrow	Up Swipe	To go to the next file or folder in the current directory.
Review previous file after image is zoomed	Dot 3	Not Available	To navigate to previous image when the currently displayed image is zoomed.

Review next file after image is zoomed	Dot 6	Not Available	To navigate to next image when the currently displayed image is zoomed.
Move to first file	Space + Dots 1 2 3	Not Available	Press [Space + Dots 1 2 3] to move the selection to the first file in the current folder.
Move to the last file	Space + Dots 4 5 6	Not Available	Press [Space + Dots 4 5 6] to move the selection to the last file in the current folder.
Close a file or folder	Dot 7	Not Available	If you are already in the File Management mode, press [Dot 7] to move to parent directory. If you are in File Viewer mode, then currently opened file will be closed. If you are at the root level, [Dot 7] does nothing.
Scroll through file information	Left Arrow	Right Swipe	This command moves through the file information/properties by moving in the backward direction.
Scroll through file information	Right Arrow	Left Swipe	This command moves through the file information/properties by moving in the forward direction. Also, if the name of the file is more than the display size, first it scrolls through the complete name and then displays the file properties.
Create a new Folder	Space + O (Dots 1 3 5)	Not Available	This command opens the Edit Box where you can type the name of the new folder.
Delete a file or folder	Space + D (Dots 1 4 5)	Not Available	This action deletes the currently selected file or folder.
Rename a file or folder	Space + R (Dots 1 2 3 5)	Not Available	The Rename File command allows you to change the name of a file or folder. To use it, press the Rename command. The device responds with an Edit Box containing the original file or folder name. Edit the name or type a new one and press select key. To discard changes, press Select + Dot 7 keys.
Cut a file	Space + X (Dots 1 3 4 6)	Not Available	This action cuts the currently selected file from its location and places it on the clipboard to be used with the paste command.
Copy a file	Space + C (Dots 1 4)	Not Available	The Copy File command makes a copy of the currently selected file and places it on the clipboard to be used with the paste command.

Paste a file	Space + V (Dots 1 2 3 6)	Not Available	This action pastes the file or folder into the current location in the File Manager.
Multiple files/folders selection	Space + M (Dots 1 3 4)	Not Available	Selects presently displayed file/folder for cut/copy/delete operation

Graphiti Plus gives an option of Fast searches by typing any letter. For example, on pressing dots 1 and 2, file manager will show the first file name starting with the letter b.

Once the image is opened, the device will switch its keypad functionalities for reviewing the images. Refer [Reviewing Images](#) for key commands.

Note that file manager commands are not available when the image is open except for commands listed below:

1. File navigation
2. Close a file

The device remembers the file name and its path. Whenever you enter the standalone mode, the device automatically jumps to the last directory and shows the last file name.

While navigating through the file list, the device rolls over from first to last or last to first file automatically after the navigation limit and emits a long vibration pulse.

To discard file or folder's paste operation any time, press Dot 7 key. After pressing Dot 7 key, the device asks for "Confirm action". Press Dot 8 to cancel or Dot 7 to continue paste operation.

The device will show the message "sd wr protected" if write protection is enabled.

15 Reviewing Images

Once an image is displayed on the device from any source like a PC, storage media, HDMI, the device provides the following functionality:

1. Navigation through images
2. Zoom in and Zoom out
3. Panning through zoomed image
4. Rotate image
5. Invert image color
6. Selection of different image processing algorithm variants

15.1 Image Processing Algorithm Variants:

There are 6 different processing variants which can be changed by pressing 'Select' key from the device keypad. The user can navigate through the

processing variants using key combinations. Refer [Commands for Reviewing Images](#) for more information.

Different variants work better on different types of input images. For example, for images containing line drawing, “1 Bit Monochrome” is preferable, while for color images, “8 Bit Gray” generate better results. Therefore, the device allows you to explore the effects of different algorithms on the input image.

The supported image variants are:

1. 1 Bit Monochrome
2. 2 Bit Grayscale
3. 8 Bit Grayscale
4. 8 Bit Sharpen level 1
5. 8 Bit Sharpen level 2
6. 8 Bit Sharpen level 3
7. 8 Bit Sharpen level 4

This processing includes different levels of gray scaling and sharpening of the image after resizing it to the device’s native pin grid size (40 x 60).

15.2 Commands for Reviewing Images

The key sequences for invoking operations related to image processing are as listed in the table below.

Description	GUI Button	PC Keyboard	Device Keypad	Touch Panel
Zoom in: Incremental zoom in by 1x, up to 32x	Zoom In	Add (+) key	Dot 5	Not Available
Zoom in with small step size 0.1	Not Available	Ctrl + Plus key	Dot 4	Not Available
Zoom in max: Displays the original image	Zoom in Max	Alt + Plus key	Select + Dot 4	Not Available
Zoom out: Incremental zoom out by 1x, up to default image view	Zoom Out	Minus (-) key	Dot 2	Not Available
Zoom out with small step size 0.1	Not Available	Ctrl + Minus key	Dot 1	Not Available
Zoom out max: Resets the view to its default state	Zoom Out Max	Alt + Minus key	Select + Dot 1	Not Available
Review previous file after image is zoomed	Not Available	Up Arrow key after pressing Alt + F	Dot 3	Not Available
Review next file after image is zoomed	Not Available	Down Arrow key after	Dot 6	Not Available

		pressing Alt + F		
Rotate Image Left – 90 Degree	Rotate Left	Ctrl + 'L'	Select + Left	Not Available
Rotate Image Right – 90 Degree	Rotate Right	Ctrl + 'R'	Select + Right	Not Available
Navigates the pan window in the upward direction by 25 percent of display size	Up	Up Arrow	Up Arrow	Down Swipe
Navigates the pan window in the downward direction by 25 percent of display size	Down	Down Arrow	Down Arrow	UP Swipe
Navigates the pan window in the right direction by 25 percent of display size	Right	Right Arrow	Right Arrow	Left Swipe
Navigates the pan window in the left direction by 25 percent of display size	Left	Left Arrow	Left Arrow	Right Swipe
Navigates the pan window by a single pixel in the upward direction	Not Available	Ctrl + Up Arrow	Space + Up Arrow	Not Available
Navigates the pan window by a single pixel in the downward direction	Not Available	Ctrl + Down Arrow	Space + Down Arrow	Not Available
Navigates the pan window by a single pixel in the left direction	Not Available	Ctrl + Left Arrow	Space + Left Arrow	Not Available
Navigates the pan window by a single pixel in the right direction	Not Available	Ctrl + Right Arrow	Space + Right Arrow	Not Available
Moves to the top left corner of the image	Not Available	Not Available	Left Arrow + Up Arrow	Not Available
Moves to the bottom left corner of the image	Not Available	Not Available	Left Arrow + Down Arrow	Not Available
Moves to the top right corner of the image	Not Available	Not Available	Right Arrow + Up Arrow	Not Available
Moves to the bottom left corner of the image	Not Available	Not Available	Right Arrow + Down Arrow	Not Available
Image Variants	Not Available	Ctrl+ 'A' key then Up or Down Arrow key	Select key	Not Available

Selects next image variant	Not Available	Not Available	Dot 5 6	Not Available
Selects previous image variant	Not Available	Not Available	Dot 2 3	Not Available
Selects first image variant	Not Available	Not Available	Dot 1 2 3	Not Available
Selects last image variant	Not Available	Not Available	Dot 4 5 6	Not Available
Centers the pan window to the desired location	Not Available	Not Available	Not Available	Double Tap
Inverts the image	Invert tick box	Ctrl + 'I'	Dot 8 5	Not Available
Loads the image with latest timestamp from the current folder (Only supported in operations with GUI)	Not Available	F5	Not Available	Not Available

16 Reviewing CSV Files (for custom drawings)

The device supports and shows custom drawings created using a csv file. You can create such drawings (files) on a computer or mobile device and can view it either from the user GUI or from the SD card.

16.1 File format

A file can be created by providing height level values and blinking rate values for each pixel. Values for height level and blink rate is as shown in the table below.

Value	Height Level
0	No height
1	Height Level 1
2	Height Level 2
3	Height Level 3
4	Height Level 4

Value	Blinking Rate
0	No Blinking
1	100ms
2	200ms
3	300ms
...	...
50	5 seconds

This file contains two sections namely “Pixel Height” and “Blinking rate”. Pixel height section contains the height value of each pixel and blinking rate section contains the blinking interval for each pixel.

The following example shows an image that is 5 x 5 pixels in size and shows a 3 x 3 pixels rectangle with pixels of height 4 a flashing pixel in its middle, blinking once every 5 seconds.

Pixel height

```
0,0,0,0,0
0,4,4,4,0
0,4,4,4,0
0,4,4,4,0
0,4,4,4,0
0,0,0,0,0
```

Blinking rate

```
0,0,0,0,0
0,0,0,0,0
0,0,50,0,0
0,0,0,0,0
0,0,0,0,0
```

17 Reviewing PDF Files

Review the Pdf files on the device in the standalone mode. The supported file types are:

1. PDF
2. PDF-a

The device shows the pdf page converted to image on the device display. After the image is displayed, you can perform the image processing operations as described in [Reviewing Images](#) section.

Note: PDF processing time is high. If you want to cancel the operation at any point of time, press Dot 7. The device will bring you to the file manager. Also, please note that the device will show only the first page of the pdf file.

17.1 User Indication

Scenario	Message	Vibration Indication
After opening the PDF file and using the “Select” key	“please wait.”	Single short vibration pulse once in every 2 seconds
Indication during PDF processing	File Name	Vibration pulses once in every 2 seconds
For invalid PDF file	“invalid file”	Long vibration pulse

18 Slideshow Mode

The Slideshow mode can be activated by pressing “SPACE + Dots 1 3 4 8” in the local mode. The device starts displaying the image from the present folder.

1. Images from the present directory gets displayed one by one. The device rolls over from the last image file to the first image file automatically.
2. Only supported images gets displayed in the Slideshow mode.
3. The device shows “No Files” and emits long vibration in case of no valid files or empty directory. It exits the Slideshow mode automatically.
4. To navigate within the files, use the keys (Up Arrow / Down Arrow) and gestures in the Slideshow mode.
5. The Slideshow mode can be stopped by pressing any key except Up, Down Arrow and Space + g (Dots 1 2 4 5) key combination (these keys are used for navigation and gesture control). The device performs the operations according to the pressed keys. For example, pressing Dot 2 key in the Slideshow mode zooms-in the presently displayed image and exit the Slideshow mode.
6. The default time interval between two images displayed is 5 seconds. This setting can be changed from the menu.
7. The Slideshow mode works only in local mode and make sure the images exist in the present working directory.

19 The Reader

The Graphiti Plus can be used as a stand-alone multiline reader. Having BRF or TXT content on an inserted SD card turns it into an on-the-go braille book reader. You can go through different files by pressing Up and Down arrow keys from the file manager.

19.1 Reader Commands

The following commands are available.

To...	Press	Additional information
Open the file	Select or Dot 8	Open file in reader mode
Close the file	Dot 7	Close the reader mode and go to the file manager
Go to Previous or Next display	Up and Down arrow key	Scroll the previous or next 160 characters
Go to previous or Next page	Dot 3 and dot 6	Pressing Dot 3 or Dot 6 moves the display back or forward in the file to the next page marker (form feed) or 1000 characters, whichever comes first.

20 The Editor

Graphiti Plus also offers the ability to write and edit text. This feature allows you to edit existing files on the SD card.

While you are in the Edit mode, the cursor notes the current position by blinking Dot 8. The default setting for the cursor is 1 second.

20.1 Editing a file

Scroll to the desired file in file manager and press Space + Dot 1 + Dot 5 (Space + E) to enable editor. You can edit the file from reading mode also by pressing the same command from Reader mode.

It shows the first 160 characters of the file and starts the cursor blinking at the first character.

20.2 Insert/delete text and Navigation

Use Select + Up and Select + Down arrow keys for panning. Pressing Select + Down arrow key shows the next 160 characters of the file. To go back to the previous 160 characters, press Select + Up arrow key.

You can move the cursor using the arrow keys Up, Down, Left and Right).

To insert text, type text at the cursor. You can insert any text into an open file using the braille keys (Dot 1 to Dot 8). The Editor adds the typed text into the file. You can delete the character by pressing Dot 7 key.

To exit Editor, press Space + q (Dot 1 to Dot 5). The cursor disappears, returning you to the file manager by closing and saving that file.

Please note maximum file size for editing mode is up to 2 MB.

20.3 Selection of word/ delete multiple characters at a time

By pressing Select key once, it will set selection mark at the current cursor location. Then selection of characters, words or line can be done using right arrow key.

You can navigate to the right direction up to the end point of selection (within current display of 160 characters only). The device will highlight selection by rising Dot 7 and Dot 8 for the selected characters.

By pressing Dot 7 will delete the selected characters.

If you want to deselect the selected characters, press select key.

20.4 Editor Commands

The following commands are available.

To...	Press	Additional information
Enable Editor	Space + E (Dot 1 + Dot 5)	Open file in Editing mode

Close Editor	Space + Q (Dot 1 to Dot 5)	Save the file and close the editor mode
Move cursor to previous or next character	Left and Right Arrow keys	Navigates the cursor from left to right or right or left to right
Move cursor to previous or next line	Up and Down arrow keys	Navigates the cursor from up to down or down to up
Go to Previous or Next display	Select + Up and Select + Down arrow keys	Scroll the previous or next 160 characters
Delete character	Dot 7	Removes the characters before the cursor and update the file and display
Word/Line Selection or Deselection	Select	By pressing Select key once, it will set selection mark at the current cursor location. Then selection of words or line can be done using right arrow key.

21 Labelled Images

It is possible to add image label such that Graphiti Plus can show that image label while reviewing the image in local mode.

For that the image must be updated as shown in the steps below,

1. Run the Graphiti PC application
2. Browse any image.
3. Press “Edit 60x40 view” Or “Edit Source Image” button available on the image edit section in the Main tab.
4. It will open drawing window with that image.
5. Now there are two ways to add label
 - a. Hidden label
 - i. Select the pixel where you wish to add a label.
 - ii. Press keys “Ctrl + Enter” to enable edit box to write the label.
 - iii. Type appropriate label. PC utility will show the typed label at left side of the drawing tab.
 - iv. After typing label press Ctrl+ W on PC keyboard to update the image metadata/property.
 - v. Save the image in JPG format.
 - b. Visual label
 - i. Select font type “**8 dot computer braille**” or “**Visual fonts**” in drawing window
 - ii. Select the pixel where you wish to add a label.
 - iii. Write something.
 - iv. Here no need to press “**Write**” button here.

21.1 Reviewing label on the device

Once the label is added, you can copy that JPG file to Graphiti Plus.

While reviewing the images with labels, if you touch at the location which contains label, it shall give you an audio beep and the vibration indication indicating that there is a label. If you tap at that location, the label shall be displayed on the Braille display. To see the labels on the tactile display, press SPACE + DOT3 keys.

Note: Make sure the label pixel is not covered under the message bar. Pixel will not blink if it is shadowed by system message. In such cases, you can disable system messages temporary using space + dot 3. The device will show image labels, even if the message bar is disabled.

1.

22 Graphiti Plus to other Graphiti Plus

Interestingly, you can draw an image on Graphiti Plus and review that same image on another Graphiti Plus real time if you connected two Graphiti Plus units with each other

Please perform the following steps to connect the Graphiti Plus to another Graphiti Plus using USB Serial mode.

1. Set Serial mode (Space + Dot 8) in Graphiti Plus unit 1 and 2.
2. Connect Graphiti Plus unit-2 (Device) to Graphiti Plus unit-1 using the Standard A to Micro B USB cable. Insert A-Male to Graphiti Plus unit-1 and Micro B to Graphiti Plus unit-2.
3. Now Graphiti Plus unit-1 will act as host.
4. Enable draw mode (Space+ Dot 1) in Graphiti Plus unit-1.
5. Draw something on Graphiti Plus unit-1. Same drawing will be reflected on Graphiti Plus unit-2.
6. Enable draw mode (Space + Dot 1) in Graphiti Plus 2 and draw something on Graphiti Plus 2. The same drawing will be reflected on Graphiti Plus 1.
7. Press Dot 6 to enter into review mode in Graphiti Plus 1.
8. Review the Image on Graphiti Plus 1.
9. Press Dot 6 again to exit from review mode in Graphiti Plus 1.

Note: If Graphiti Plus 1 is in review mode and something drawn on Graphiti Plus 2 It will be reflected on Graphiti Plus 1.

Limitations:

1. Two Graphiti Plus units must be connected to each other only after configuring them for serial mode.
2. Once Graphiti Plus device is connected with Graphiti Plus Host, Graphiti Plus will not allow mode switching and it will give long vibration indication.

3. If you want to change mode, then remove the USB cable from Graphiti Plus Host first and then press “Space + Dots 1 2 5 6” keys to exit from Graphiti Plus to Graphiti interface mode. There is no key sequence to enter in Graphiti Plus to Graphiti Plus interface mode.
4. In case of any problem, device reset will fix the problem.

23 Visual Fonts

This feature allows you to have file names and system messages in the visual font form instead of braille.

You can select visual font in upper or lower case from the preference menu.

In order to enable/disable this feature press Space + Dot 4 5 8.

24 QWERTY Keyboard Interface

You can attach the external USB keypad (HID) to the USB Host port of Graphiti Plus. Once Graphiti Plus detects the keypad, you can use for reading/edit text/BRF file in local mode.

Presently QWERTY keyboard is supported only for BRF and Text file in reader and editor mode. The key commands are as shown in the table below.

24.1 For Reader mode

To...	Press	Additional information
Go to Previous or Next display	Up and Down arrow key	Scroll the previous or next 160 characters
Go to previous or Next page	Page Up and Page Down	Pressing Page Up or Page Down moves the display back or forward in the file to the next page marker (form feed) or 1000 characters, whichever comes first.

24.2 For Editor mode

You can edit content of file using QWERTY keypad once you are in editor mode. Presently the device supports following inputs from the QWERTY Keyboard,

1. Alphanumeric (capital and small letters) and Number keys (available on top of the alphabets and not from the numeric keypad),
2. Arrow keys and Page UP/DOWN keys,
3. Space, Enter and Backspace keys

The key commands are as shown in the table below.

To...	Press	Additional information
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Move cursor to previous or next character	Left and Right Arrow keys	Navigates the cursor from left to right or right or left to right
Move cursor to previous or next line of display	Up and Down arrow keys	Navigates the cursor from up to down and down to up
Go to Previous or Next display	Page Up and Page Down	Scroll the previous or next 160 characters
Delete character	Backspace	Removes the characters before the cursor and update the file and display

Limitations:

Graphiti Plus will not accept any input from the QWERTY keyboard if the typing speed is fast. It will accept only 2 characters per 1 second.

25 Screen Mirroring

The device supports screen mirroring in local and HDMI mode so that the display content of the device can be displayed on the Graphiti PC utility. This is helpful for the sighted person.

The screen mirroring sub mode can be activated by pressing space + dot 8 + dot 2.

Screen mirroring will be automatically disabled in all other modes except for local and HDMI mode.

It is recommended to disable screen mirroring when not in use to avoid the device latency.

26 Firmware Upgrade

There are separate firmware upgrade mechanisms for Graphiti Plus sub-systems.

The main Graphiti Plus system firmware can be upgraded by copying the firmware binary to SD card and following the upgrade procedure.

The firmware binary can be copied to SD card using the following ways:

1. Copying the new binary into SD card using an SD card reader.
2. Attaching the unit to a PC in mass storage mode and copying the new binary.

Once the SD card is inserted into the device with the latest binary, enter the firmware upgrade mode and upgrade the device. The device will emit short vibration pulses every two seconds to show the upgrade progress. On successful upgradation, the device reboots and shows the message “upgrade successful” on the display. Please refer “Graphiti Upgrade Manual” for more details.

Firmware for Graphiti Plus and the Braille sub-system are to be done separately.

26.1 The Braille sub-system

You need Firmware upgrade utility to update the Braille display sub-system. It can be downloaded from our website from here

<https://www.orbitresearch.com/wp-content/uploads/2021/04/Orbit-Reader-40-Firmware-Upgrade-Utility-vB0.00.00.02r00.exe>

Use the Type – C USB port to do the Braille sub-system upgrade.

The procedure for the Braille sub system is as follows.

Press and hold down the Right Panning forward button + Dot 5, then press Dot 8. The utility shows the message “Orbit Reader 40 is connected” in the Device status field.

It shows the message “Do you want to upgrade the device?” in the message field at the bottom of the dialog of the firmware upgrade utility.

Release Dot 8 first, then release the Right Panning key and Dot 5 and click on the “Upgrade” button.

27 BIST Mode

The BIST mode is used to check the pins working.

BIST Entry: Press and hold Space bar and tap Power key five times.

BIST Exit: Press and hold Space bar and tap Power key five times. The device returns to the previous mode on exiting the BIST.

Once you are in BIST mode, the pin test commands are as described in the table below:

To...	Do this on the Device Keypad	Additional Information
Set all pins Up	Select + Up Arrow	Sets all pins at height level 4
Set all pins Down	Select + Down Arrow	Resets all pins to height level 0
Set all pins at home position	Select + Space	All pins move in the downward direction to home position just below the touch panel surface.

28 System Log

The system log helps to debug the problem when it occurs at user end while using the device.

The device logs this information in its internal memory. To copy a file in the SD card, press Space + t (Dots 2 3 4 5). If the log file size is more, the device can take a few seconds and displays “Please wait” indication along with buzzes at the time of copy. After successful copy, the device shows “transfer completed” message. Once the log file is copied to the SD card, access it either using the card reader or by putting the device in mass storage mode. Send that log to us for further analysis.

To...	Do this on the Device Keypad
Transfer system log to storage media (SD card or USB Stick)	Space + Dots 2 3 4 5

29 Limitations

1. Two finger gestures are not supported.
2. The PDF conversion time in local mode is high.
3. Drawing and reviewing can be done simultaneously, but with inconsistency. The reviewing finger may switch to drawing finger anytime.
4. The device will not show progress for file and folders' cut, copy and paste operations.
5. The device will save the drawn pattern on the PC in the form of a CSV file.
6. 'Recent file' feature will not work when SD card is write-protected.

30 Compatibility

In Graphiti Plus, the USB interface (VCP(Serial) and HID mode) are tested and verified with Windows 10. It is expected to work with Windows 7 and 8 as well as with the other host platforms (Mac, iOS, Android, Linux, etc.) provided appropriate drivers are available. However, operation and performance are not tested on these platforms.

The PC utility is tested and verified with Windows 10 only. It may work with Windows 7 and later versions but is not tested with these. The PC utility is not compatible with other host platforms.

The HDMI interface is compatible with versions 1.4 and 1.4A of the HDMI standard. It is expected to work with all the HDMI versions as HDMI is forward and backward compatible.

31 Troubleshooting

In case the device does not work as expected, the following steps will help you to troubleshoot the issue.

31.1 Unit does not turn on

- Make sure the switch given at the bottom of the unit for enabling the battery power is switched On or not. If not then turn on that switch.
- Make sure the battery is not completely drained. If such a case, then connect the charger to the device.
- If the power key is not pressed long enough then this case should occur. The power key is required to be pressed for around 2 seconds till one long vibration occurs.

31.2 The preference menu cannot be open in HDMI mode when the screen reader is connected.

- In HDMI mode if the braille display is connected with the NVDA screen reader application, by default the Key operations are being sent to the Screen reader application (i.e., **Remote** key operation mode).
- To open the preference menu of Graphiti Plus, it is required to change the key operation mode to **Local** key operation by long pressing the **SELECT** key.
- The braille display should show a braille message as “**Key Operation – Local**”.
- Now the user will be able to perform local operations such as opening a preference menu.

31.3 Cannot read the local braille messages when connected to screen reader application

- When Graphiti Plus is connected with the Screen reader application, by default both the braille messages will be displayed on the braille display:
 - Local braille messages such as charger event message or menu items of Preference menu.
 - The braille messages are being received from the screen reader application.
- Hence if both the braille messages come at the same time then there might be the chance of one of the messages are being overwritten by the other.
- To avoid the abovementioned scenario, then based on the user's choice the Graphiti Plus's braille display can be configured for showing only one of the braille messages by pressing the following key commands:
 - Show Local messages only – **Long press DOT1** key
 - Show Screen reader's messages only – **Long press DOT2** key.
 - To show both the braille messages (Default option)– **Long press DOT3** key.

31.4 Touch response is not reflected on PC Screen in HDMI mode

There could be multiple possibilities for this issue.

- Graphiti Plus is in Review mode.

Solution: Press DOT6 to disable the Review mode and then try to touch on the tactile display the touch response should be replicated on the PC screen.

- The micro-B USB cable is not plugged in properly.

Solution: Check if the connection of the micro-B USB cable in the micro-B USB port is proper or not.

- The micro-B USB cable is faulty.

Solution: Replace the micro-B USB cable.

- The touch response is currently not supported for finger move gestures.

31.5 PC screen is not reflecting on the tactile display of Graphiti Plus in USB mode

- Check whether the USB COM port of the Graphiti Plus can be found in the Device Manager on PC. If not, then verify the connection between the Graphiti Plus unit and the Laptop/PC. For ex. identify the faulty USB port or faulty micro-B USB cable.
- Press Insert + A keys on PC's keyboard to enable the auto connect feature of NVDA Graphiti Plugin developed by Ken, the plugin should find the COM port of the Graphiti Plus and get connected with Graphiti Plus unit,

31.6 Other Suggestions

1. Graphiti Plus is in either of the USB mode:
 1. Check whether the external power supply is properly connected or not.
 2. Close the utility, turn off the device and retry the normal startup procedure.
2. Graphiti Plus is in USB-Serial (VCP) mode:
 1. Make sure that the device driver is installed in your PC. Refer to the Graphiti VCP driver folder for more details.
 2. After proper installation of USB drivers, check whether the USB port is generated in the "Device Manager" window. The Device Manager can be opened by following the procedure below:

 Right click "My Computer" → Select "Manage" option → Select "Device Manager" option under "System Tools" → Open the "Ports" section.
 3. A port named "PI USB to Serial (COMx)" should be generated. If no such port is generated, try using a different USB port on the PC or restart the PC by following the normal startup procedure.
3. SD Mode:
 1. If the device shows SD error message, then remove and insert the SD card again.

2. If the error persists, then do the device power cycle.
4. Bluetooth Mode: **(Not Supported in the current release)**
 1. If the Host PC is not showing the device, turn Off the Bluetooth in the Host and On it again after 5-10 seconds and check. The host will display the device name like “MB PR 4C A000x”.
 2. If the host is not showing the device name, make sure the device Bluetooth is On and the device is in Bluetooth mode. Check device setting in preference menu.
 3. In case of a problem, you can also try steps as shown in the “**Error! Reference source not found.**” section.
5. HDMI mode: In case of “HDMI source error”, you can remove the HDMI cable and insert it again and refer “HDMI” interface section again.

32 Appendices

32.1 Appendix A: Revision History

Rev.	Date	Description of Changes	Author
1.0	11th October 2022	Initial Release	