Power Management

Power Management (PM) is a very integral part for the device functionality. The purpose of the Power Management is to minimize the power consumption of devices during its inactive state by using configuration settings and maintaining few best practices. The PM supports different power modes and provides wake-up sources from sleep modes on specified time.

Supported Devices

Power Management is applicable mainly for devices with battery power like:

- e285
- e280
- e235
- V400m

There are few configurations (based on powermngt_line_powered settings) applicable to Line Powered devices like, M400, P400, P200 M400, v200, v400c.

Power Management States

Power Status List

The following table lists of power management states and related device characteristics.

> Note
>
> Communication column mentioned in the table below is excluded of Ethernet, as Ethernet cannot be active or powered on in low power modes.

State Name	SOC State	Communication	Peripheral Devices	Display
Boot	Active	On	On	On
Active	Active	On	On	On
Standby	Active	On	On	On/Off
Sleep	Standby	On	On	On/Off
Deep sleep	Deep Sleep	On	Off	Off
Hibernate	Hibernate	Off	Off	Off
Reboot	Active	Off	Off	Off
Off	Off	Off	Off	Off

Note

Peripheral Devices means Secondary devices connected with Bluetooth.

Definitions of State Terms

SOC State Name	Description
Active	Active state of the device with all features available and background operations On. If there is no WiFi activity the WiFi chip will enter Doze mode.
Auto	Automatic transition from one state to another, when the device is battery powered.
Boot	Device starts or the powered up mode.
Standby	This state is to save power when the device is not actively being used. It allows the device to resume its operation quickly, when needed and reducing the power consumption during periods of inactivity.
Sleep	This is the inactive state of device, where the device will not be functional with any background operations for the configured time with a Sleep mode screen display.
Deep Sleep	Doze mode - The radio, analogue domains, and most of the linear regulators are powered down. The rest of the BCM43455/BCM4343W remains powered up in an IDLE state. All main clocks (PLL, crystal oscillator, or TCXO) are shut down to reduce active power to the minimum. The 32.768 kHz LPO clock is available only for the PMU sequencer. This condition is necessary to allow the PMU sequencer to wake up the chip and transition to Active mode. In Doze mode, the primary power consumed is due to leakage current.
Hibernate	Power-down mode—The BCM43455/BCM4343W is effectively powered off by shutting down all internal regulators. The chip is brought out of this mode by external logic re-enabling the internal regulators.
Off	The state of the device is powered off.

PM State Availability

VOS2

SOC State Name	Battery Powered	Line Powered
Boot	On	On
Active	On	On
Standby	On	On
Sleep	On	On
Deep Sleep	On	On
Hibernate	On	On
Reboot	On	On
Off	On	On

Wake Up Source

Wake up can be triggered by different wake up sources as per the below table. The following table lists default wake up settings for SCA based on different wake up sources.

Wake Up Sources	Default Settings
WiFi	Y (Enabled)
Bluetooth	Y (Enabled)
Mobile data	Y (Enabled)
USB Host	N (Disabled)

Configuration

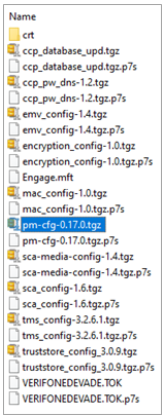
Power Management can be enabled using different configuration based on devices and setting the required parameters in power management configuration files (pm_cfg).

Configuration File Location

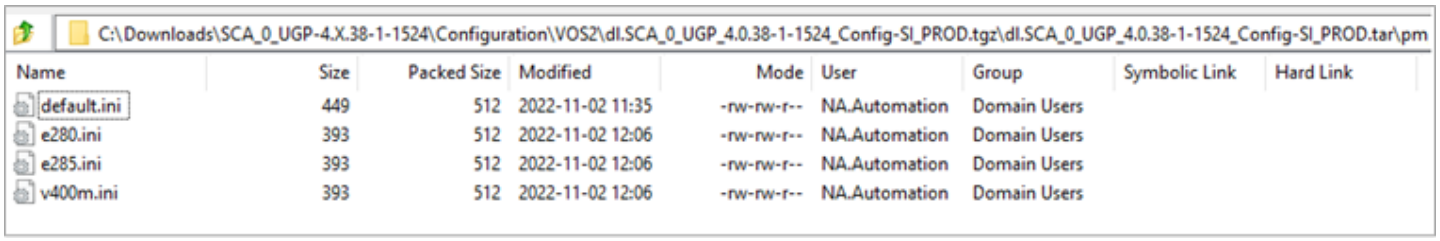
Power Management (PM) configuration files are located in **pm_cfg-x.xx.x.tgz** folder and the locations are provided in the below table. Based on the user requirement, pm_cfg folder could be consist of different device specific `.ini` files (like `e280.ini, e285.ini, e235.ini, v400m.ini` as in ADK-PM) along with `default.ini` file. Default `.ini` file settings are applicable to all devices. However, if any device specific `.ini` file is present in the package, and the application running on that particular device, will consider the device specific `.ini` file settings over `default.ini` file.

Files	Defines	Location
PM Config Folder	Defines the folder, which contain the default and device specific config files as shown in ADK-PM.	• **VOS2:** SCA_0_UGP-X.X.XXConfigurationVOS2dl.SCA_0_UGP_X.X.XX_Config-SI_PROD.tgzdl.SCA_0_UGP_X.X.XX_Config-SI_PROD.tarpm_cfg-0.16.1.tgzpm_cfg-0.16.1.taradk_pm_0.16.1.tgzadk_pm_0.16.1.taradk-pm • **VOS3:** SCA_UGP-X.X.XX.X4ConfigurationVOS3dl.UGP_Config_VSP_VOS3-X.X.XX.X.tarPM_Config.csd.tgzPM_Config.csd.tarPM_Config-2.0.0adk-pm
Default Config File	Defines the default config settings for required fields of the Config file structure.	SCA_0_UGP-X.X.XXConfigurationVOS2dl.SCA_0_UGP_X.X.XX_Config-SI_PROD.tgzdl.SCA_0_UGP_X.X.XX_Config-SI_PROD.tarpm_cfg-0.16.1.tgzpm_cfg-0.16.1.taradk_pm_0.16.1.tgzadk_pm_0.16.1.taradk-pmdefault.ini
Device Specific Config File	Defines the device specific config file. For example, if the application is running on e280 device, then this will consider the e280.ini config file details, if present. If the e280.ini config file is not present then the application should consider default.ini file.	SCA_0_UGP-X.X.XXConfigurationVOS2dl.SCA_0_UGP_X.X.XX_Config-SI_PROD.tgzdl.SCA_0_UGP_X.X.XX_Config-SI_PROD.tarpm_cfg-0.16.1.tgzpm_cfg-0.16.1.taradk_pm_0.16.1.tgzadk_pm_0.16.1.taradk-pme280.ini

Location of pm-cfg in Configuration folder:



List Config Files in pm-cfg > adk-pm



Configuration File Structure

Here the default values in the below table are recommended values from Verifone to set in the config file.

Section	Field	Units	Default value	Description
powermngt_battery	auto	bool	y	Automatic state of transition of the device when it is battery powered. Values are y (enable) and n (disable).
powermngt_battery	boot	s	60	Timeout for the transition from boot to active when the device is battery powered. Value is in seconds.
powermngt_battery	standby	s	15	Timeout for transition to standby when the device is battery powered. Value is in seconds.
powermngt_battery	sleep	s	-1 (infinite)	Timeout for transition to sleep when the device is battery powered. Value is in seconds.
powermngt_battery	deep_sleep	s	30	Timeout for transition to deep sleep when the device is battery powered. Value is in seconds.

Section	Field	Units	Default value	Description
powermngt_battery	hibernate	s	-1 (infinite)	Timeout for transition to hibernate when the device is battery powered. Value is in seconds.
powermngt_battery	off	s	-1 (infinite)	Timeout for transition to off when the device is battery powered. Value is in seconds.
powermngt_line_powered	auto	bool	y	Automatic state of transition of the device when it is battery powered. Values are y (enable) and n (disable).
powermngt_line_powered	boot	s	60	Timeout for transition from boot to active when the device is line powered. Value is in seconds.
powermngt_line_powered	standby	s	15	Timeout for transition to standby when the device is line powered. Value is in seconds.
powermngt_line_powered	sleep	s	-1 (infinite)	Timeout for transition to sleep when the device is line powered. Value is in seconds.
powermngt_line_powered	deep_sleep	s	-1 (infinite)	Timeout for transition to deep sleep when the device is line powered. Value is in seconds.
powermngt_line_powered	hibernate	s	-1 (infinite)	Timeout for transition to hibernate when the device is line powered. Value is in seconds.

Section	Field	Units	Default value	Description
powermngt_line_powered	off	s	-1 (infinite)	Timeout for transition to off when the device is line powered. Value is in seconds.
battery	shutdown_on_critical	bool	y	Automatic shutdown of the device on critical battery level. Values are y (enable) and n (disable).
battery	active_while_charging	bool	y	Automatic state of transition to active mode while device is charging. Values are y (enable) and n (disable).
display	boot	%	50	This backlight level is used in boot state. Allowed values are 1 to 100. 0 is prohibited due to limitation.
display	active	%	50	This backlight level is used in active state. Allowed values are 1 to 100. 0 is prohibited due to limitation.
display	standby	%	1	This backlight level is used in standby state. Allowed values are 1 to 100. 0 is prohibited due to limitation.
display	sleep	%	0	This backlight level is used in sleep state.
display	off	%	0	This backlight level is used in off state.

Section	Field	Units	Default value	Description
display	active_during_transition	bool	n	This is to enable or disable the display during the state of transitions. Values are y (enable) and n (disable). • If set to enable, then the display will not be turned off during the transitions. • If set to disable, then the display will be turned off during the transitions.
x_key	hibernate_delay	s	-1 (infinite)	Duration (in seconds) to hold X key for transition to hibernate (<1 to disable).
x_key	powerdown_delay	6	s	Duration (in seconds) to hold X key to powerdown the device (<1 to disable).
x_key	reboot_delay	s	-1 (infinite)	Duration (in seconds) to hold X key to reboot device (<1 to disable)
x_key	pcp_delay	s	4	Duration (in seconds) to hold X key to activate Power Control Panel (<1 to disable).

Section	Field	Units	Default value	Description
x_key	event_delay	s	2	Duration (in seconds) to hold X key to send an event that the user is pressing X key (<1 to disable).
o_key	reboot_delay	s	6	Duration (in seconds) to hold O (green) key to reboot the device (<1 to disable). **NOTE:** This is applicable to VOS3 only.
power_button	power_pcp_delay	s	4	Duration (in seconds) to hold Power button to activate Power Control Panel. The duration should be < 6. **NOTE:** This is applicable to VOS3 only.
wakeup_sources	wifi	bool	y	This is to enable or disable WiFi as a wakeup source. Values are y (enable) and n (disable).
wakeup_sources	bt	bool	y	This is to enable or disable Bluetooth as a wakeup source. Values are y (enable) and n (disable).
wakeup_sources	usb_host	bool	n	This is to enable or disable USB cable as a wakeup source. Values are y (enable) and n (disable).
wakeup_sources	mobile_data	bool	y	This is to enable or disable Mobile data as a wakeup source. Values are y (enable) and n (disable).

Section	Field	Units	Default value	Description
wakeup_sources	proximity	bool	n	This is to enable or disable the proximity as a wakeup source by tapping a CTLS card. Values are y (enable) and n (disable).
pci_reboot	reboot	bool	y	This is to enable or disable PCI reboot warning.
pci_reboot	pci_wakeup_to_alert	bool	y	This is to enable or disable the terminal waking up to active state to notify on PCI reboot.
pci_reboot	alert_start	s	300	Timeout before first PCI reboot notification.
pci_reboot	interval	s	30	Notification interval before PCI reboot.
wake_up_pending_timeout	suspend	s	5	Abort transition to Sleep or Deep Sleep if the device wake up is pending.
wake_up_pending_timeout	hibernate	s	20	Abort transition to Hibernate if the device wake up is pending.
power_control_panel	sleep	bool	y	This is to show or hide Sleep button in the Power Control Panel. Values are y (enable) and n (disable).
power_control_panel	deep_sleep	bool	y	This is to show or hide Deep Sleep button in the Power Control Panel. Values are y (enable) and n (disable).

Section	Field	Units	Default value	Description
power_control_panel	hibernate	bool	y	This is to show or hide Hibernate button in the Power Control Panel. Values are y (enable) and n (disable).
power_control_panel	reboot	bool	y	This is to show or hide Reboot button in the Power Control Panel. Values are y (enable) and n (disable).
power_control_panel	off	bool	y	This is to show or hide Off button in the Power Control Panel. Values are y (enable) and n (disable).

SCA Configuration for Battery Threshold

Following configuration settings are provided by SCA application to control the Battery Threshold.

Parameter Name	Description	Valid/Max Values	Default Value	Location (Table)
THRESHOLD	This parameter is used to set the value for Battery Threshold at which further transactions are not allowed.	Numeric, 2	10 (10%)	Application
BATTLOWWARNING	Battery Threshold at which an unsolicited warning message is sent to POS.	Numeric, 2	20 (20%)	Application

Wake Up Configuration Settings

Wake up can be triggered by different wake-up sources as per the below table. When device is waking up it will automatically transition to active state. Some wakeup sources can be enabled and disabled in configuration file.

State Name	Communication					Power		User activity - Keypad	
	Ethernet	WiFi	Serial Port	Bluetooth	Mobile Data	USB cable	Power Cable	Any key	Green key

State Name	Communication					Power			User activity - Keypad	
						Host mode	Plugged in	Plugged out		
Standby							On	On	On	On
Sleep	Off	On	On	On	On	Off	On	On	On	On
Deep sleep	Off	On	On	On	On	Off	On	On	On	On
Hibernate							On			On
OFF							On			On

SCA Standard - PM and Battery Performance

The recommended power management settings are present in the package contains the default.ini file. Customer specific configuration can be overwritten by having device specific files like e280.ini, v400m.ini files in the config package.

Default PM Config Package: `PM_CFG_v0.16.0.tgz`
Config Settings:

```
[powermngt_battery]
auto=y
boot=60
standby=15
sleep=-1
deep_sleep=30
hibernate=-1
off=-1

[powermngt_line_powered]
auto=y
boot=60
standby=15
sleep=-1
deep_sleep=-1
hibernate=-1
off=-1

[battery]
shutdown_on_critical=y
active_while_charging=y

[display]
boot=50
active=5
standby=1
sleep=0
off=0
active_during_transition=n
sensor=n
```

```
[x_key]
hibernate_delay = -1
powerdown_delay = 6
reboot_delay = -1
pcp_delay = 4
event_delay = 2

[wakeup_sources]
wifi=y
bt=y
mobile_data=y
usb_host=n
```

Battery Charging Time

Device Type	VHQ Heartbeat Frequency	Time taken for 0 to 100% Battery charge
e280	5 mins	133.8 minutes(2.23 hrs)
e285	5 mins	80 minutes(1.33 hrs)
V400M	5 mins	145 minutes (2.42 hrs)

Battery Performance - System Idle

This table provides the details on the time taken to drain entire battery when the device is in Idle state (not performing any transactions)

Device Type	VHQ Heartbeat Frequency	Time taken to drain from 100% to 10%
e280	5 mins	316 minutes(5.2666 hrs)
e285	15 mins	119 minutes(1 hrs 59 mins)
V400M	5 mins	320 minutes (5.33 hr)

Battery Performance - Continuous Usage

This table provides the details on the time taken to drain entire battery when the device is **continuously running the transactions.**

Device Type	VHQ Heartbeat Frequency	Time taken to drain from 100% to 10%
e280	5 mins	223 minutes(3.761 hrs)
e285	15 mins	63 minutes
V400M	5 mins	3 hr 58 mins

Battery Performance - Medium Usage

This table provides the details on the time taken to drain entire battery when the device is doing transactions with medium intervals in between.

Device Type	VHQ Heartbeat Frequency	Time taken to drain from 100% to 10%
e280	5 mins	252 minutes (4.2 hrs)
e285	15 mins	97 minutes(1.61 hrs)
V400M	5 mins	320 minutes (5.33 hrs)

Battery Performance - Heavy Usage

This table provides the details on the time taken to drain entire battery when the device is doing transactions with less intervals.

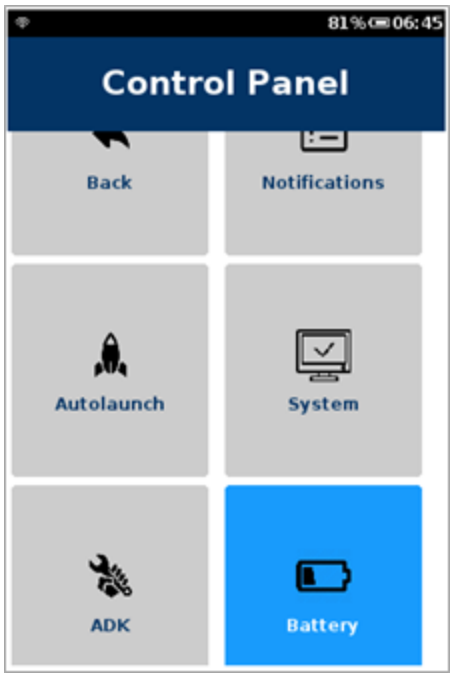
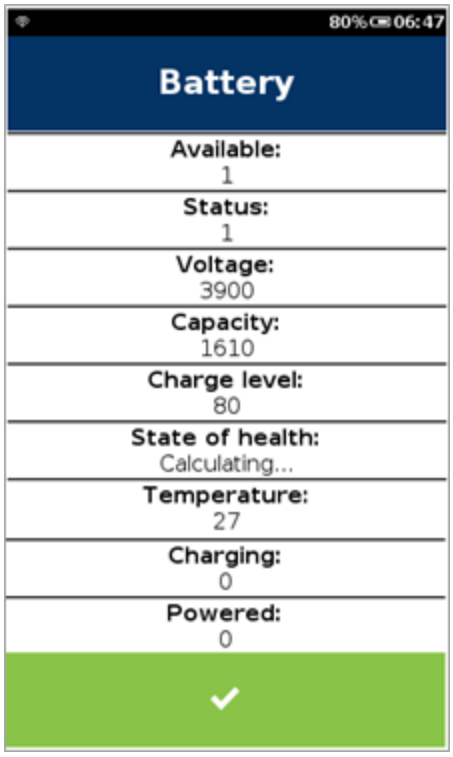
Device Type	VHQ Heartbeat Frequency	Time taken to drain from 100% to 10%
e280	5 mins	220 minutes
e285	15 mins	80 minutes
V400M	5 mins	3 hr and 54 min

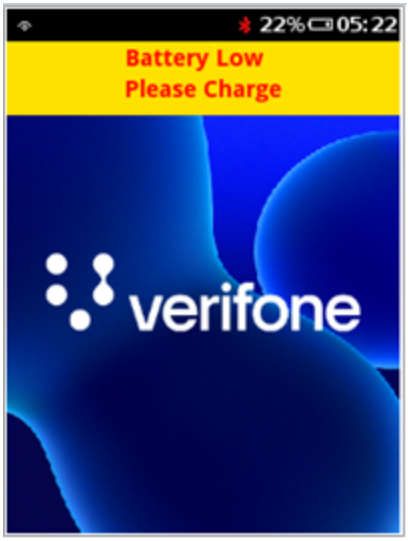
Checking Battery Specification

Following are the steps to check Battery Status on the Device:

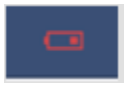
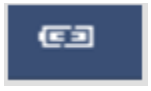
Device Display	Decription

	This is the Idle screen. Press **1 5 9** in keypad devices and the side button in case e280 to access the **Control Panel**.
	Select the Control Panel.

	Select the **Battery** option from Control Panel.
	Battery screen displays the details: • Available: availability of battery is 1. • Voltage: Battery voltage 3900V • Capacity: Battery capacity is 1610 mAh. • Charging Level: Battery is 80% charged. • Temperature: 27o C is displaying as battery temperature. • Charging: 0 means not charging and 1 means charging. • Powered: 0 means not connected with line powered, and 1 means connected with line powered.

	Displays the battery percentage (79%) and the device is line powered (charging).
	Low Battery notification, when the battery level will be less than 25%. • The Status Bar displays the Battery % and Battery Icons. • Application Level Battery Notifications will be displayed on Idle Screen.

Status Bar for Battery

Icons	Decription
	Battery normal
	Battery low
	Battery fault
	Device is line powered

Power Control Panel

Device Display	Decription
	• Using Power Control Panel, the terminal can be forced to change into specific state of Power control like, Sleep/Deep Sleep/hibernate or to reboot/shutdown. • To access Power Control Panel, navigate to MAC Menu > Control Panel > Power Panel option. • Options appearing on the Power Control Panel are configurable based on the pmcfg.ini file.

Best Practices for Battery Devices

- It is recommended to avoid the frequent use of Secondary port Status commands for checking the application status. This can cause terminal to wake up from the sleep mode and cause the consumption of battery and eventually reducing the battery level.
- VHQ Heartbeat frequency should be set to higher duration, example - 60mins, so that the device should not wake up frequently and the consumption of battery can be avoided.
- It is recommended to avoid VHQ Download with Low Battery level in the devices. VHQ download will not happen, if the battery level is below 15%.
- This is to ensure that device should be kept active with transaction command only when it is actually being used for the purpose of payment.