Power Consumption and Management on Polycom Phones

Engineering Advisory 48152

This engineering advisory shows detailed information about the power consumption and management of the Polycom® SoundPoint® IP desktop phones, Polycom® SoundStation® IP and Polycom® SoundStation Duo conference phones, Polycom® VVX® business media phones, Polycom® RealPresence Trio™, and Polycom® CX series phones.

This engineering advisory applies to the following Polycom solutions:

- SoundPoint IP phones running UC software 3.3.0 or later
- SoundStation IP phones running UC software 3.3.0 or later
- SoundStation Duo phones running UC software 4.0.0 or later
- VVX 300/310 and VVX 400/410 phones running UC software 4.1.4 or later
- VVX 500 phones running UC software 4.0.1B or later
- VVX 600 phones running UC software 4.1.2 or later
- VVX 1500 phones running UC software 3.3.0 or later
- VVX 101/201 phones running UC software 5.4.0 or later
- VVX 301/311 phones running UC software 5.4.1 or later
- VVX 401/411 phones running UC software 5.4.1 or later
- VVX 501 phones running UC software 5.4.1 or later
- VVX 601 phones running UC software 5.4.1 or later
- RealPresence Trio collaboration solution running UC software 5.4.0 or later
- CX500, CX600, CX700, and CX3000 phones running software 4.0.7577.4372 or later

The topics in this advisory include:

Power Management

Why Power Management is needed

The phone draws power from the switch or power adapter to power itself and peripherals attached to it. The actual power drawn by a phone varies with the combinations of peripherals attached. If a phone tries to draw more power than a switch or power adapter can provide, this can result in brownout conditions such as power loss, peripheral malfunction, and reboots. To handle this discrepancy in power, the phones use a centralized power management system that carries out power budgeting and allocates power to the peripherals according to a priority sequence.

How the phone budgets power to peripherals

VVX Business Media Phones

Fixed priority sequence: When the phone is not connected to a call, the priority of the peripherals is fixed and as follows: **Expansion Module** > **Top port USB Device (camera)** > **Rear Port USB Device**. In the case of a power deficit, devices with lower priority may be powered down to power on a device with higher priority. In the case of VVX 401/411, there is only a single USB port, and this will be second in priority after the Expansion module.

First Come First Serve Priority Sequence: When the phone is connected to a call, first come first serve priority is followed in the case of a power deficit, irrespective of the priority; the devices that are attached will not be powered on.

RealPresence Trio

Fixed priority sequence: The RealPresence Trio 8800 core platform is always powered. This includes wireless functions (Wi-Fi, Bluetooth, and NFC). Downstream PSE PoE Power of the LAN OUT port and USB Charging are two configurable power options. If both are allowed, then PSE PoE Power takes precedence and USB Charging setting is ignored. If a Class 0 POE power source is detected, then both PSE PoE Power and USB Charging settings are ignored and both features are disabled.

The following table shows how much power needs to be reserved before a peripheral is connected.

Table 1: Power Reservation for different peripherals on Polycom VVX Business Media Phones

Phone Model	*Power Reserved for the phone*	*Power Reserved for EM*	*Power Reserved for Top USB Port*	*Power Reserved for Rear USB Port*	*Power reserved for Bluetooth*

VVX 500	5.0 watts (W)	0W	0.5W	0.5W	N/A
VVX 600	5.4W	0W	0.5W	0.5W	0.3W
VVX 401	4.5W	0W	N/A	0.5W	N/A
VVX 501	5.0W	0W	0.5W	0.5W	N/A
VVX 601	5.7W	0W	0.5W	0.5W	0.3W

Table 2: USB power output for VVX Business Media Phones

Phone Model	*Max power output for Rear USB Port*	*Max power output for top USB port*	*Max power output for side USB port*
VVX 500	2.5W, 0.5 ampere (A)	2.5W, 0.5A	N/A
VVX 600	2.5W, 0.5A	2.5W, 0.5A	N/A
VVX 1500	N/A	N/A	2.5W, 0.5A
VVX 401	2.5W, 0.5A	N/A	N/A
VVX 501	2.5W, 0.5A	2.5W, 0.5A	N/A
VVX 601	2.5W, 0.5 A	2.5W, 0.5A	N/A

Top USB port on touchscreen models

The top USB port on VVX 500/501 and 600/601 models is recommended for use with the VVX Camera only

The following table shows how much power needs to be reserved before a peripheral is connected.

Table 3: Power Reservation for different peripherals on Polycom RealPresence Trio

Phone Model	*Power Reserved for*				
	for the unit	*Wireless (Bluetooth, NFC, Wi-Fi)*	*Expansion Mics*	*USB Host Ports (charging)*	*LAN OUT Port (PoE)*
Trio 8800 (PoE)	8.1W	0.3W	0.2W	0.6W *(n/a)*	n/a

Trio 8800 (PoE+)	11.8W	0.3W	0.2W	0.6W *(3.2W)*	2.2W (Class 1) 5.0W (Class 2) 13.0W (Class 0)
Trio Visual+	5.2W	n/a	n/a	n/a	n/a

The power reservation for the RealPresence Trio 8800 and RealPresence Trio Visual+ are higher when connected to a 1000 Mbps LAN and when RealPresence Trio Visual+ is directly connected to Trio 8800's LAN OUT port and the system is powered by a IEEE 802.3at (PoE+) compliant power source.

Table 4: USB power output for RealPresence Trio

Phone Model	*Max power output for USB Host Port 1 (charging)*	*Max power output for USB Host port 2*
RealPresence Trio 8800	0.6 W, 0.1 A *(2.5W, 0.5 A)*	N/A
RealPresence Trio Visual+	0.6 W, 0.1 A	0.6 W, 0.1 A

USB Charging or PSE PoE Power

USB Charging and PSE PoE Power of the LAN OUT port of the Trio 8800 are mutually exclusive and cannot be enabled at the same time.

Power Dissipation

Testing of the Polycom phones reveals the power consumption data shown in the following table.

Note: When the CDP Advertisement is Displayed

Only Polycom phones running UC software 3.3.0 or later display the CDP advertisement shown in Table 5.

Table 5: Power Dissipation and Advertisement for Polycom Phones

Phone Model	*Idle State (minimum power)*	*Call State (nominal hands-free volume)*	*Maximum Power*	*Class Advertisement[1] (IEEE 802.3af)*	*CDP Advertisement[4]*
SoundPoint IP					
IP 321	2.1W	2.5W	3.4W	1	3.5
IP 331	2.3W	3.0W	3.7W	1	3.7
IP 335	2.4W	3.3W	4.3W	2	3.9
IP 450	2.2W	3.8W	5.3W	2	5.4
IP 550	2.3W	3.9W	5.6W	0	5.9
IP 560	4.1W	7.3W	8.0W	0	8.3
IP 650	3.5W	4.6W	6.5W	0	6.5, 12.0[4]
IP 650 Expansion Module (Backlit)	1.4W	n/a	2.0W	0[3]	[3]
IP 670	4.2W	7.4W	8.4W	0	8.4,14.0[4]
IP 670 Expansion Module (Color Backlit)[5]	1.5W	n/a	2.0W	0[3]	3
SoundStation IP					
IP 5000	3.7W	4.3W	6.0W	2	5.8W
IP 6000	4.1W	5.0W	7.0W	0	9.8W
IP 7000	4.6W	6.1W	9.9W	0	9.8W
Duo	3.0W	4.5W	7.0W	0	7.0W

Phone Model	*Idle State (minimum power)*	*Call State (nominal hands-free volume)*	*Maximum Power*	*Class Advertisement[1] (IEEE 802.3af)*	*CDP Advertisement[4]*
VVX					
VVX 300	1.8W	3.0W	3.5W	2,0[6]	5.0W
VVX 310	1.9W	3.1W	3.5W	2,0[6]	5.0W

VVX 400	2.4W	4.1W	4.5W	2,0[6]	5.0W
VVX 410	2.4W	4.3W	4.5W	2,0[6]	5.0W
VVX 500	3.4W	4.2W	5.0W	4[2]	8.0W
VVX 600	4.3W	5.0W	5.4W	4[2]	8.0W
VVX 1500	6.5W	9.4W	10.5W	0	11.8W
VVX 101	1.3W	2.6W	3.0W	1	5.0W
VVX 201	1.4W	2.9W	3.5W	1	5.0W
VVX 301	2.2W	3.2W	3.5W	2,0[6]	7.0W
VVX 311	2.2W	3.4W	4.0W	2,0[6]	7.0W
VVX 401	2.5W	4.2W	4.5W	3	15.4W
VVX 411	2.5W	4.5W	5.0W	3	15.4W
VVX 501	4.1W	4.6W	5.0W	4[2]	15.4W
VVX 601	4.2W	4.8W	5.7W	4[2]	15.4W
VVX Expansion Module (Paper)	0.5W	n/a	2.1W[7]	n/a[3]	n/a[3]
VVX Expansion Module (LCD)	1.4W	n/a	2.9W	n/a[3]	n/a[3]
Phone Model	*Idle State (minimum power)*	*Call State (nominal hands-free volume)*	*Maximum Power*	*Class Advertisement[1] (IEEE 802.3af)*	*CDP Advertisement[4]*
RealPresence Trio					
Trio 8800 with 2 Expansion Mics	5.8W	6.7W	7.1W	4[9]	13.0W
Trio 8800[8] with Trio Visual+	11.6W	14.3W	15.0W	4	25.5W
Trio Visual+ with Logitech C930e	4.3W	4.5W	5.2W	0	n/a[3]
CX					
CX500	2.0W	3.3W	4.3W	2	
CX600	2.4W	4.5W	4.9W	2	
CX700	3.1W	4.7W	5.2W		

CX3000	2.3W	3.3W	5.5W	3

1. See Table 6: PD Power Classification (IEEE 802.3af).
2. VVX 500 and VVX 600 advertise as Class 4, in conformance with IEEE802.3at specification (backwards compatible with IEEE802.3af).
3. Class/CDP advertised through Host Phone (no native PoE on-board).
4. CDP values are reflected for SoundPoint IP phones running SIP 3.1.0. 'EM Power' can be disabled through the phone's menu; this would lower the advertised power in CDP. The higher values reflect 'EM-enabled' CDP advertisement (default).
5. Polycom recommends that you use a power supply adapter with the SoundPoint IP 670 when more than one color Expansion Module is attached to the phone.
6. The VVX300/301/310/311/400/410 will change their power classification to level 0 when an EM is attached.
7. Paper label VVX Expansion Modules added beyond the first will use an additional 0.1W for a total of 2.2W.
8. Assumes Bluetooth is enabled and USB storage device and Trio Visual+ is supplied by PSE
9. Power over Ethernet switches that don't support IEEE802.3at (PoE+) will offer Class 0.

Power Classification changes on connecting an EM

On their own, VVX3xx/4xx phones default to PoE Class 2 signature to the PoE Switch (3.8W-6.5W). This provides sufficient power to operate the VVX phones under all call conditions.

When an Expansion Module is connected, the hard-wired signature reverts to PoE Class 0 (0-13W) after power-up, signaling to the Switch to allocate more power allowing up to 3 x Expansion Modules to be connected.

The phone must be power-cycled to initiate this PoE Class change. If you attempt to plug 3 x Expansion Modules into an already running VVX 3xx/4xx, there will be insufficient power until the next reboot.

PD and PSE Power Classification

Powered Device (PD) power classification is shown in the following table. This defines the maximum power levels available at the PD (phone).

Table 6: PD Power Classification (IEEE 802.3)

Class	*Usage*	*Maximum Power Range Used by the PD (phone)*
0	Default	0.44 to 12.95W
1	Optional	0.44 to 3.84W
2	Optional	3.84 to 6.49W
3	Optional	6.49 to 12.95W
4	Optional	VVX and Trio: 12.95 to 25.5W (IEEE802.3at, PoE+)

Power Sourcing Equipment (PSE) power classification is shown in Table 7: PSE Power Classification (IEEE 802.3af). This defines the minimum power levels available at the PSE (PoE switch).

Table 7: PSE Power Classification (IEEE 802.3)

Class	*Usage*	*Minimum Power Levels at Output of PSE (PoE switch)*
0	Default	15.4 W
1	Optional	4.0 W
2	Optional	7.0 W
3	Optional	15.4 W
4	Reserved	Reserved for future use

The deltas in power level between Table 4 and 5 provision voltage and current losses in cabling lengths of up to 100m (330ft), that may be encountered in enterprise installations.

VVX Business Media Phone Power Management Alerts

This section describes the Power Management Alerts that are displayed on a phone that uses Expansion Modules:

- "**EM1 cannot be powered on**": The power available is not sufficient to power on the first Expansion Module. To power it on, remove any USB devices that are connected to the phone or move the phone to a higher power source.
- "**EM2 cannot be powered on**": The power available is not sufficient to power on the second Expansion Module. To power it on, remove any USB devices that are connected to the phone or move the phone to a higher power source.
- "**EM3 cannot be powered on**": The power available is not sufficient to power on the third Expansion Module. To power it on, remove any USB devices connected to the phone or move the phone to a higher power source.
- "**Top port USB Device cannot be powered on**": The power available is not sufficient to power on the USB device connected to the Top USB port. To power on the device, remove any Expansion Module connected to the phone or move to a higher power source.
- "**Rear port USB device cannot be powered on**": The power available is not sufficient to power on the USB device connected to the Rear USB port. To power on the device, remove any Expansion Module connected to the phone or move to a higher power source.

- "**Top port USB Device is powered down**": The power available is not sufficient to power on an Expansion Module that was attached. According to the Fixed Priority sequence, the Top port USB device was powered down. To power on the device, remove an Expansion Module or move to a higher power source.
- "**Rear port USB Device is powered down**": The power available is not sufficient to power on an Expansion Module or a USB device on the Top USB port. According to the fixed priority sequence, the Rear port USB device was powered down. To power on the device, remove an Expansion Module or USB device on the Top USB port or move to a higher power source.
- "**Top USB port is powered down**": The power available is not sufficient to power on a non-compliant or over current drawing device connected to the Top USB port. This may happen both when the device is connected during power deficit or when a higher priority device was connected and the Top port device was powered down. To power on the device, remove and Expansion Module or move to a higher power source.
- "**Rear USB port is powered down**": The power available is not sufficient to power on a non-compliant or over current drawing device connected to the Rear USB port. This may happen both when the device is connected during power deficit or when a higher priority device was connected and the Rear port USB device was powered down. To power on the device, remove an Expansion Module or move to a higher power source.

RealPresence Trio Power Management Alerts

This section describes the Power Management Alerts that are displayed on a phone:

- **"13W Power Supply detected. Ignoring PSE and USB changing configuration"**: The power source detected (IEEE 802.3af PoE) is not sufficient to power the Trio 8800 when either PSE PoE Power (of LAN OUT port) or USB Charging is enabled. The alert will also be displayed when attempting to enable PSE PoE Power (of LAN OUT port) or USB Charging when connected to an IEEE 802.3af PoE compliant power source. The system will ignore the settings and not enable PSE PoE Power (of LAN OUT port) or USB Charging. When connecting the Trio 8800+ to an IEEE 802.3at PoE+ power source, the settings will take effect and enable PSE PoE Power (of LAN OUT port) or USB Charging.
- **"Overcurrent failure detected. Remove recently added SUB device"**: The power available via the USB host port is not sufficient to power on the USB device connected to the USB host port. USB power levels supported are up to 100mA with 'USB Charging' feature disabled and up to 500mA with 'USB Charging' enabled.

'USB Changing' of the USB host port and PSE PoE Power of LAN OUT port cannot be enabled at the same time. If both are enabled PSE PoE Power is only supported and USB Charging will be ignored.

VVX Business Media Phones Supported Devices

The USB port on the phones only supports USB thumb drives, headsets, and the VVX camera. Phones do not support DVD writers, hubs or any devices not compliant to the USB specification.

RealPresence Trio Supported Devices

The USB host port on the Trio 8800 and Trio Visual+ support USB thumb drives, headsets, keyboards, and the Logitech Webcam C930e. DVD writers, hubs, or any devices not compliant to the USB specification are not supported.

The USB host port on the Trio 8800 can be configured to support USB charging but only when PSE PoE Power for the LAN OUT is disabled.

The downstream Ethernet port (LAN OUT) of the Trio 8800 phone supports the IEEE 802.at PoE compliant devices like the RealPresence Trio Visual+ accessory.

Test Condition Terminology

The following test condition terminology was used in Table 5.

- Idle State
  - The phone has completed the boot-up process.
  - Ethernet speed at 10/100 Mbps on LAN port; PC port not connected (RealPresence Trio 8800 connected with Trio Visual+ are measured at 1,000 Mbps).
  - The idle screen is shown on the LCD.
  - Where applicable, the LCD backlight was set to a default minimum (sleep mode) brightness.
  - There was no call state established.
- Call State
  - Both LAN and PC ports running at maximum capable data rates.
  - The hands-free transducer was activated for each UUT and was set to default nominal volume.
  - Normal call established in hands-free mode.
  - The LCD backlight set to default maximum brightness.
- Maximum (or peak) Power
  - All ports and peripherals running at maximum data rates.
  - Maximum volume on hands-free transducer; running codec stress tests with select wav files.
  - LCD backlight and line LEDs set at maximum brightness.
- Class Advertisement
  - The Power over Ethernet (PoE) class advertisement circuitry on-board SoundPoint IP, SoundStation IP, and VVX phones.
- CDP Advertisement
  - The power requirements for CDP reported by SoundPoint IP, SoundStation IP, and VVX phones running minimum release of SIP 3.1.0 and BootROM 4.1.2.

- Power consumption measured using PoE IEEE802.3af standard powering
  - The measurements were taken as average from six IEEE802.3af compliant PoE switches.
  - The power consumption using AC or DC adapters is similar to above, but must account for approximately 72% efficiency rating from AC source.
  - Power consumption does not include power sourcing to external USB devices (SoundPoint IP 670, VVX 500, VVX 600, and VVX 1500 models).
- Power consumption measured at the SoundPoint IP and SoundStation IP phone end
  - 7ft maximum length LAN cord to PoE switch during measurement.
  - 2.45W maximum power loss allowable over 100m (330ft) cable lengths.

Troubleshooting Tips

This section describes some basic troubleshooting tips for the issues commonly faced while using Expansion Modules with VVX Business Media Phones.

USB Headset does not work

- Refer to the section on peripheral priority. Unplug an expansion module or any device on the Top or Rear USB port. Then reconnect the USB Headset.
- Use a higher power source.

USB pen drive does not work

- Refer to the section on peripheral priority. Unplug an expansion module or any device on the Top or Rear USB port. Then reconnect the USB Pen drive.
- Use a higher power source.

VVX Camera does not work

- Refer to the section on peripheral priority. Unplug an expansion module or any device on the Rear USB port. Then reconnect the VVX Camera.
- Use a higher power source.

Expansion Module does not work

- Unplug any USB devices connected to the Top or Rear USB ports and reconnect the Expansion Module.
- Use a higher power source.

6001 America Center Drive
San Jose, CA 95002
USA