Using Powered USB with Standard PCs

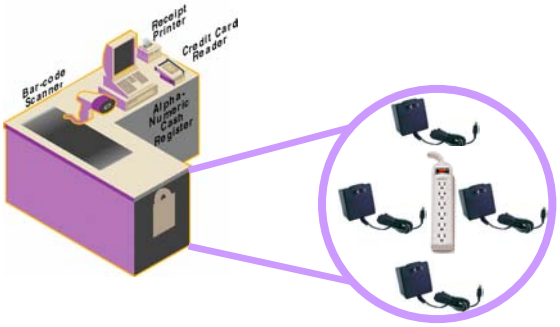
(or how to turn a conventional PC into a lean, mean POS machine!)

Application Note

What is Powered USB?

Standard USB allows peripheral devices to exchange data with a PC and also to receive device power over the USB bus. Bus power is very convenient as it can save a power supply for each bus-powered peripheral device, power strips, and more complex electrical installation. These extra costs can often add up to $100 per POS station or more.

Unfortunately, the USB 1.1 and USB 2.0 protocols limit bus supplied power to 2.5 Watts (0.5A @ +5V) per port. For low power devices such as a keyboard or mouse, this is more than enough power. The USB standard also defines support for higher current devices up to 500 mA, but the total power limit is still 2.5 Watts. For higher power devices such as printers or displays, standard USB's power limit is often insufficient, requiring such peripherals to use an external power supply. This limitation takes away from the true "plug-n-play" idea conceived for USB peripherals. It also proliferates power bricks, wires, and higher installation costs.



Because of standard USB's power limitation, IBM, NCR, and FCI/Berg jointly developed a way of expanding the USB 1.1 and USB 2.0 standards, increasing the maximum current as well as the voltage for bus-powered peripheral devices. This new design is called USB PlusPower or simply powered USB.

The USB PlusPower design provides the following voltage and current options:

- +5 volts DC at up to 6 amps per connector (up to 30 Watts)
- +12 volts DC at up to 6 amps per connector (up to 72 Watts)
- +24 volts DC at up to 6 amps per connector (up to 144 Watts)

The USB PlusPower design also includes a new USB cable design with two additional wire pairs inside the cable and modified connectors to support the new current and voltage. The new connector is backward compatible with the standard USB connector, so powered USB products also support traditional USB connections with no setting changes required.

Host: USB PlusPower, Standard

Cable: USB PlusPower, Standard

Using Powered USB

Inside Out Networks, a Digi International company, provides several powered USB products giving users flexibility in deploying this new technology. They include:

1. Multi-port Universal PCI host controller card for server-based deployment

Hubport/PCI+

2. Multi-port hub for external deployment

Hubport/4+

3. Multi-port hub combined with USB-to-serial converters

Edgeport/42+

4. USB over LAN concentrator: AnywhereUSB/4+

Each solution provides multiple USB PlusPower ports for connecting to powered USB or standard USB peripherals. This allows an inexpensive standard PC to power multiple peripherals, even high power peripherals like printers. Special PCs configured to support powered USB natively cost many times the cost of a standard PC. (Example: $500 versus $2,000) With Digi's powered USB solutions, no expensive USB PlusPower PC is required, and no power strips and power bricks are required either!

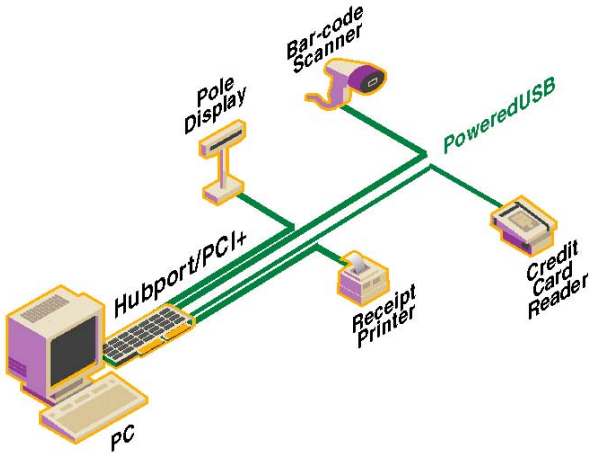
The following pages cover each solution individually.

In-the-box Powered USB

The Digi Hubport/PCI+ is a Universal PCI card (supports 3.3V or 5V PCI connections) with four USB PlusPower ports that may be installed in any Windows-based server for communicating to

and powering up to four peripheral devices. The PCI card may be powered directly from the PC into which it is installed or via an optional external power supply.

As shown in the diagram below, a standard PC with the Hubport/PCI+ can communicate with and power up to four USB or USB PlusPower devices. Each peripheral receives its power directly from the powered USB bus and does not require an additional power supply.



Benefits to this configuration include:

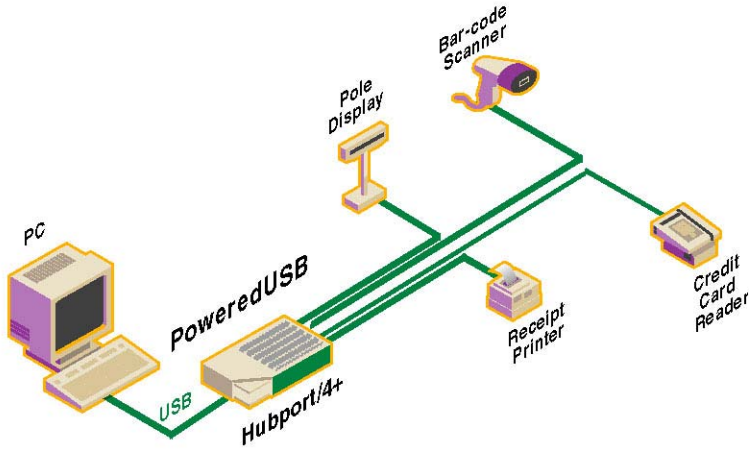
- Minimal space is required, as the Hubport/PCI+ is contained within the PC and no external power supplies are required for the peripherals.
- An inexpensive standard PC may be used to power multiple peripherals, even high power peripherals like printers; no expensive USB PlusPower PC is required.
- Power may be supplied by the PC directly or via one external power supply if the PC has insufficient power available. No external power supplies are required for peripherals.
- Digi's patent pending power balancing technology provides maximum power to 12 volt and 24 volt peripherals without exhausting the PC's 5 or 12 volt power.
- Flexible power management is included which easily allows power to be monitored and turned on and off on a single device or all devices.
- A cable locking mechanism is provided for extra-secure connections.
- USB PlusPower peripherals and standard USB peripherals are supported.
- Drivers are available for a full range of Windows operating systems.

Out-of-the-Box Powered USB

The Digi Hubport/4+ is an external USB hub with four USB PlusPower ports that may be connected to any standard USB Windows-based server for communicating to and powering up to four peripheral 

devices. The hub is powered by its own external power supply.

As shown in the diagram below, a standard PC connected to the Hubport/4+ can communicate with and power up to four USB or USB PlusPower devices. Each peripheral receives its power directly from the powered USB bus and does not require an additional power supply.



Benefits to this configuration include:

- Maximum flexibility, as the Hubport/4+ presents the standard plug-and-play characteristics of USB without requiring the installation of a card in the PC.
- Multiple hubs can be daisy chained just like with standard USB.
- An inexpensive standard PC may be used to power multiple peripherals, even high power peripherals like printers; no expensive USB PlusPower PC is required.
- Drivers are available for a full range of Windows operating systems.
- Power is supplied from a single external power supply instead of one power supply per peripheral.
- Flexible power management is included which easily allows power to be monitored and turned on and off on a single device or all devices.
- A cable locking mechanism is provided for extra-secure connections.
- USB PlusPower peripherals and standard USB peripherals are supported.

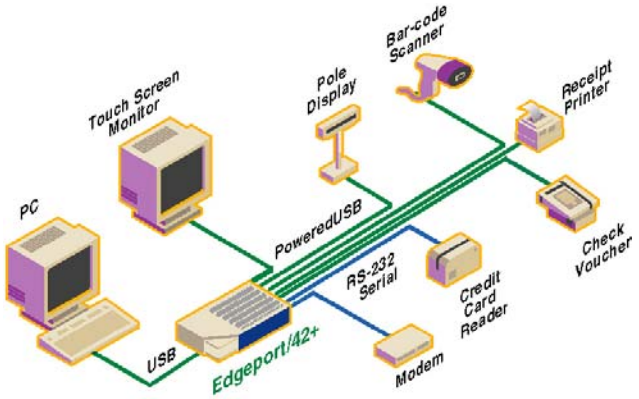
Hybrid Powered USB and Serial Ports

Not every prospective user of powered USB is an all USB shop. Many still have legacy serial peripheral devices. A hybrid solution from Digi, combining USB PlusPower with support for serial devices, can be a perfect fit for such organizations.

The Digi Edgeport/42+ is an external USB hub with four USB PlusPower ports and with two serial ports that may be accessed via USB. The Edgeport/42+ may be connected to any

Windows-based server for communicating to and powering up to six peripheral devices. The hub is powered by its own external power supply.

As shown in the diagram below, a standard PC connected to the Edgeport/42+ can communicate with and power up to four USB or USB PlusPower devices. Each USB peripheral receives its power directly from the powered USB bus, eliminating additional power supplies. In addition, two RS-232 serial devices may be connected and accessed over USB from the same PC.



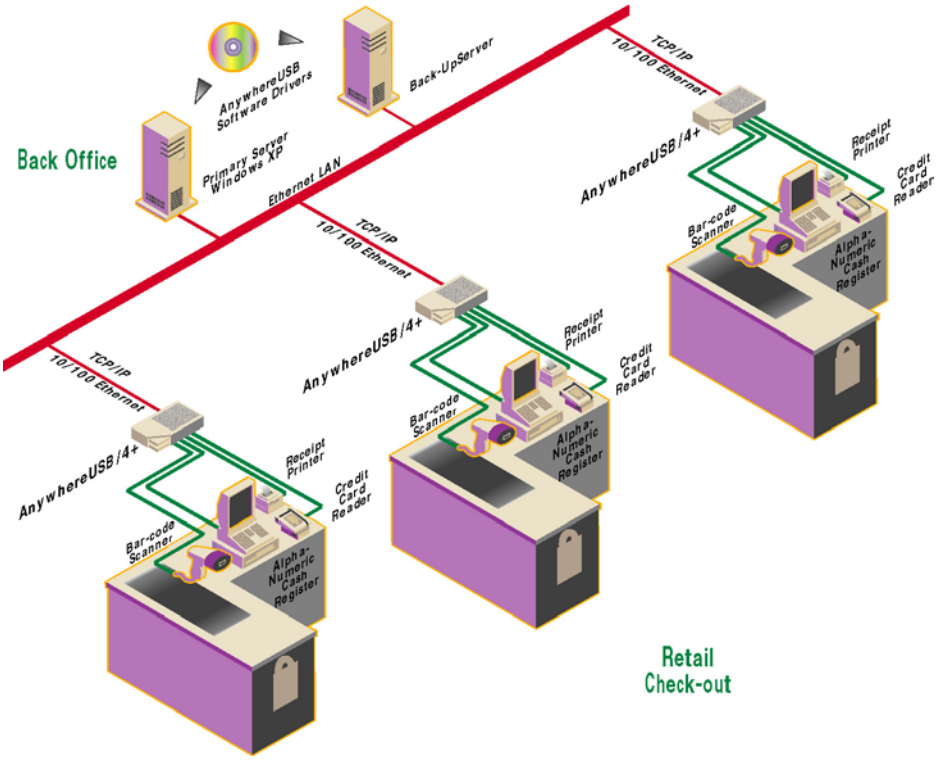
Benefits to this configuration include:

- Combining USB, USB PlusPower, and serial ports all using a single external hub.
- Maximum flexibility, as the Edgeport/42+ presents the standard plug-and-play characteristics of USB without requiring the installation of a card in the PC.
- An inexpensive standard PC may be used to power multiple peripherals, even high power peripherals like printers; no expensive USB PlusPower PC is required.
- Multiple hubs can be daisy chained just like with standard USB.
- Power is supplied from a single external power supply instead of one for each peripheral.
- Flexible power management is included which easily allows power to be monitored and turned on and off on a single device or all devices.
- A cable locking mechanism is provided for extra-secure connections.
- USB PlusPower peripherals, standard USB peripherals, and RS-232 serial peripherals are supported.
- Drivers are available for a full range of Windows operating systems.

Powered USB Over a LAN

The Digi AnywhereUSB/4+ is an Ethernet-based USB concentrator with four USB PlusPower ports that may be connected to any standard Ethernet or wireless LAN allowing remote servers to communicate to up to four peripheral devices while the concentrator provides USB bus power for each peripheral. The concentrator is powered by its own external power supply.

As shown in the diagram below, standard PCs may communicate remotely over an Ethernet LAN with the AnywhereUSB/4+ which is connected to and can power up to four USB or USB PlusPower devices. Each peripheral receives its power directly from the USB bus and does not require an additional power supply.



Benefits to this configuration include:

- Maximum distance, as the AnywhereUSB/4+ allows USB peripherals to be accessed over an Ethernet or wireless LAN at virtually unlimited distance.
- An inexpensive standard PC may be used with multiple peripherals, even high power peripherals like printers; no expensive USB PlusPower PC is required.
- Drivers are available for a full range of Windows operating systems.
- Power is supplied from a single external power supply instead of one power supply per peripheral.
- Flexible power management is included which easily allows power to be monitored and turned on and off on a single device or all devices.
- A cable locking mechanism is provided for extra-secure connections.
- USB PlusPower peripherals and standard USB peripherals are supported.

Digi Powered USB Solution Summary

All Products

- An inexpensive standard PC may be used to power multiple peripherals, even high power peripherals like printers; no expensive USB PlusPower PC is required.
- Four USB PlusPower ports are provided, one for 24 volt connections and 3 for 12 volt connections. 5 volt USB connections can be made on all ports.
- Drivers are available for a full range of Windows operating systems.
- Power may be supplied by the PC directly or via one external power supply.
- Flexible power management is included which easily allows power to be monitored and turned on and off on a single device or all devices.
- A cable locking mechanism is provided for extra-secure connections.
- USB PlusPower peripherals and standard USB peripherals are supported.
- Standard Digi warranty

Hubport/PCI+

- Minimal space is required, as the Hubport/PCI+ is contained within the PC and no external power supplies are required for the peripherals.
- Power may be supplied by the PC directly or via one external power supply. No external power supplies are required for peripherals.
- Digi's patent pending power balancing technology provides maximum power to 12 volt and 24 volt peripherals without exhausting the PC's 5 or 12 volt power.

Hubport/4+

- Maximum flexibility, as the Hubport/4+ presents the standard plug-and-play characteristics of USB without requiring the installation of a card in the PC.
- Multiple hubs can be daisy chained just like with standard USB.
- Power is supplied from a single external power supply instead of one power supply per peripheral.

Edgeport/42+

- Maximum flexibility, as the Edgeport/42+ presents the standard plug-and-play characteristics of USB without requiring the installation of a card in the PC.
- Power is supplied from a single external power supply instead of one power supply per peripheral.
- USB PlusPower peripherals, standard USB peripherals, and RS-232 serial peripherals are all supported.

AnywhereUSB/4+ (available 1Q04)

- Maximum distance, as the AnywhereUSB/4+ allows USB peripherals to be accessed over an Ethernet or wireless LAN at virtually unlimited distance from the PC.
- Maximum flexibility, as the AnywhereUSB/4+ presents the standard plug-and-play characteristics of USB without requiring the installation of a card in the PC.
- Power is supplied from a single external power supply instead of one power supply per peripheral.