

TECHTIP 03.11.01

Ethernet Expansion Hub for Personal Daq™

INTRODUCTION

USB communications is becoming popular for PC to peripheral connectivity for both home and workplace applications. The IOtech Personal Daq™ series of data acquisition modules are a powerful and easy to use signal measurement system that takes advantage of the large scale availability of USB technology in today's off the shelf computer systems. Important advantages of USB connectivity include the ability to use HUBS to expand a single port to multiple devices, the ability of the USB port to provide operating power to externally connected devices, and the ease of *plug-and-play* connectivity of external devices.

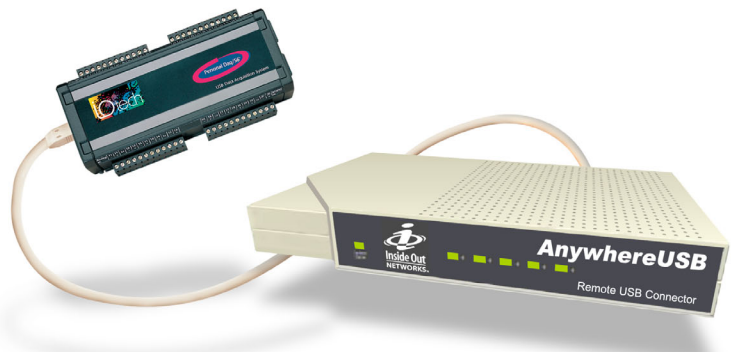
Like all communications technologies, USB technology has limitations that make it unsuitable for certain applications. The most common limitation that effects users of USB based data acquisition is the inability to exceed five meter cable lengths between the PC and the external device. Although it is possible to expand USB systems using USB hubs, it can be difficult or impossible to integrate these devices into large scale distributed I/O systems when using traditional USB hubs. It is most common to find USB based data acquisition systems being used in fairly close proximity to the computer that is running the data acquisition software package.

The following tech note describes a unique approach to using the IOtech Personal Daq data acquisition modules in conjunction with the AnywhereUSB Ethernet to USB expansion hub designed by IONetworks to create a very powerful yet economical approach to configuring a distributed I/O system.

DISCUSSION

IOtech Personal Daq data acquisition modules can be used in conjunction with IONetworks AnywhereUSB devices to create an economical, high channel count, distributed I/O system that breaks the barrier of traditional cable length limitations of USB.

This approach has been taken by a systems integrator to meet the requirements of a distributed I/O system to monitor and control a

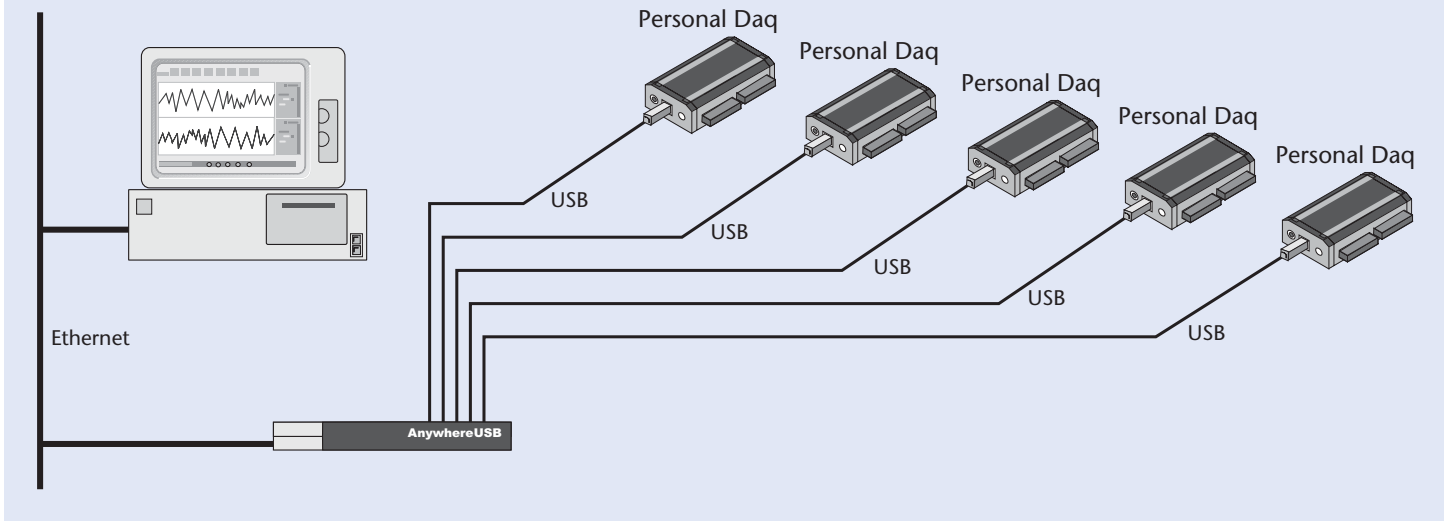


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large scale multiple test cell environment. The test facility is used for long term product life-cycle testing of industrial equipment. Each test cell is comprised of multiple thermocouples, analog voltages, digital inputs, digital outputs, and pulse input signals. One Personal Daq/56 with PDQ2 expansion module is mounted to the wall of each of 16 test cells in the facility. This allows for up to 30 differential voltages or thermocouples, 16 digital inputs or outputs, and 4 pulse counter inputs to be placed in each individual test cell location. These signals are generated by various transducers that are placed on the unit under test which measure physical parameters that are used for product life-cycle calculations. Up to 4 AnywhereUSB devices are strategically placed throughout the facility to provide USB to Ethernet connectivity back to a single main computer for each of the installed Personal Daq systems. A standard Ethernet switch allows for the 4 AnywhereUSB devices to independently connect to one standard Ethernet connection on the main PC. The test facility occupies a floor space area of approximately 70 ft x 30 ft.

The IONetworks AnywhereUSB device is used to distribute the Personal Daq modules throughout the product test facility while at the same time connecting them back to the main

Typical AnywhereUSB system with Personal Daq modules



data acquisition computer through standard Ethernet connections. The AnywhereUSB system accomplishes this by utilizing *USB over IP* technology. Each Anywhere USB device is comprised of 5 standard USB connections that are converted to one standard 10/100BaseT Ethernet connection. The AnywhereUSB device is supplied with a DC power transformer to plug into a standard AC power outlet. Each individual USB port on the AnywhereUSB device is then capable of fully powering each Personal Daq module that is connected to it. The AnywhereUSB device can be connected back to the main data acquisition computer using either direct point to point Ethernet connection to the computer or by using company wide Ethernet network connections. In the case of the life-cycle product testing lab, 4 Anywhere USB devices were used throughout the facility to connect 16 Personal Daq modules together to form a single large data acquisition and test system that is accessed by a single remote computer. Each AnywhereUSB installation point allows for 5 Personal Daq modules to be located up to 300 feet away from the Ethernet connection.

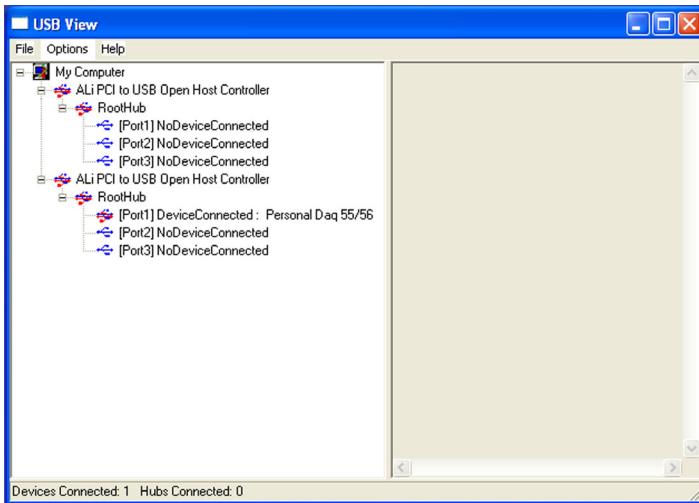
Further system expansion is possible by using standard USB hubs at each AnywhereUSB location to increase the number of USB ports beyond the standard five built in ports.

Standard data acquisition software packages are used to access the Personal Daq modules connected through Ethernet. The AnywhereUSB device is supplied with software drivers that install on the main data acquisition computer which create virtual USB ports within the operating system. Personal Daqview Plus™, DASyLab®, LabVIEW®, custom C++, and Visual Basic® programs are able to access each remote Personal Daq module as if it were actually connected to a real USB port on the host computer. This configuration makes for a seamless integration into existing software packages that already support multiple Personal Daq connections.

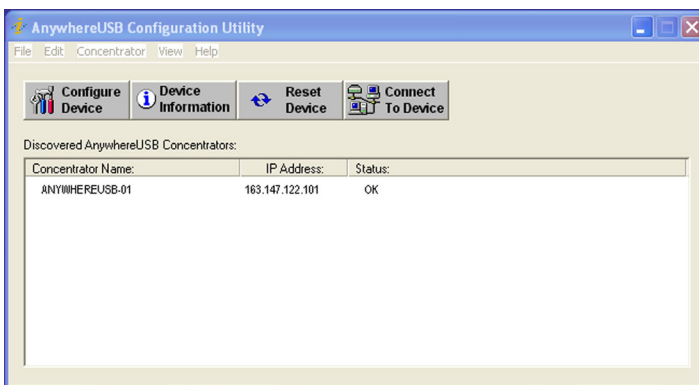
INSTALLATION & SETUP

The following is a summary of what is required to install and setup a Personal Daq system using AnywhereUSB converters.

1. IOtech Personal Daq systems consisting of Personal Daq modules with the required channel count configuration for your application, USB cable, and Personal Daqview Plus software.
2. IONetworks Anywhere USB converter which includes the USB to Ethernet converter, power cable, and software drivers included on CD
3. Install IOtech Personal Daqview Plus software and device driver and confirm the proper operation of Personal Daq modules by using a built in USB port on the PC (if available)
4. Connect power to the AnywhereUSB device and connect an Ethernet crossover cable between the AnywhereUSB device and the computer
5. Copy the AWUSB folder from the Anywhere USB driver CD to your PC hardrive
6. Run SETUP.EXE in the AWUSB folder to install the Anywhere USB drivers
7. Run AWUSBCFG.EXE in the AWUSB folder to run the AnywhereUSB configuration utility.
8. Select the AnywhereUSB device from the list of available devices in the configuration window.
9. Select the *connect to device* button in the configuration utility.
10. You should now be connected to the AnywhereUSB device. If the configuration utility reports any errors, consult the AnywhereUSB documentation.
11. Run USBVIEW.EXE in the AWUSB folder. This utility will allow you to monitor device connections on each of the new USB ports that are created by the AnywhereUSB device.



USB View software utility



AnywhereUSB configuration utility

- Plug the IOtech Personal Daq module into one of the USB ports of the AnywhereUSB device. You will be prompted by Windows to provide the drivers for the newly connected hardware. Follow the instructions in the Personal Daq documentation for installing Personal Daq device drivers.

NOTE: It is very important that you follow this procedure closely and do not attempt to bypass the installation of the IOtech Personal Daq device drivers. This step is performed once for each of the 5 ports on each Anywhere USB device that you are installing.

- Once you have properly installed the drivers for the Personal Daq device it will show up in the device window of the USBVIEW program showing the device description and serial number. At this point, the Personal Daq modules can be removed and connected to the AnywhereUSB device at anytime and the software will automatically recognize the device.

- You can now run the appropriate software interface to configure and acquire data from the Personal Daq modules. Personal DaqView Plus allows you to connect to multiple Personal Daq modules by selecting VIEW ACTIVE DEVICES under the VIEW pull down menu in Personal DaqView Plus. You can now select any of the available Personal Daq modules for use in the same acquisition configuration.

TYPICAL APPLICATIONS

Applications that would benefit from the use of multiple Personal Daq modules connected through AnywhereUSB devices include:

- Systems that require a large number of I/O channels.
- Installations that have monitoring points located considerable distances away from the PC
- Applications that need to monitor multiple test cells or test chambers using one PC

Remember that the Ethernet connectivity does not provide any increased data input rates from the Personal Daq modules. The Personal Daq modules still follow the same specifications for data sample rates. The Ethernet connection is only used as a convenient way to connect multiple units to the same system.

KEY FEATURES

- Connect up to five Personal Daq modules to a PC or network using standard 10/100BaseT Ethernet interface
- Operating power is supplied to all five Personal Daqs through USB connections
- Included USB connection management software displays connected Personal Daq systems by serial number
- Compatibility with software packages supporting multiple Personal Daq connections (including Personal DaqView Plus and DASyLab®)
- Ethernet connection allows for locating Personal Daq systems up to 300 feet away from host PC or network connection
- Multiple AnywhereUSB configurations can be combined with standard Ethernet and USB hubs for even greater system expansion
- Any built-in USB ports on the host PC remain fully functional and can support Personal Daq connections at the same time

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