The ability to remotely monitor and control power supply parameters has become increasingly more important over the years. WIENER recognizes this and provides many possibilities for remote monitoring. Whether you are working with a standard power supply or a highly customized crate, you will find a control interface that fits your application.

The table below is a guideline to the WIENER control interfaces and the products for which they will work. For more information about a specific interface and what software is available for that interface, please see the section specific to that interface.

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<tr>
<th>CAN-bus Introduction</th>
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<td>Controller Area Network (CAN) is a broadcast, differential serial bus standard, developed by Robert Bosch GmbH in the 1980s. Originally it was designed to connect electronic control units (ECUs). CAN was specifically designed to be robust in electromagnetically noisy environments and can use a differentially balanced line. Typically twisted pair cables are used for even better resistance to noise. Although initially adopted for automotive purposes, today CAN is used in many embedded control applications that may require resistance to noise. CAN-bus features an automatic, 'arbitration free' transmission. A CAN message transmitted with highest priority will 'win' the arbitration, and the node transmitting the lower priority message will sense this and back off and wait. This is ideal for system monitoring because it allows a node with a problem to send an unsolicited package, informing of the issue. The data rate for CAN-bus is dependent upon the lengths in the network. For lengths less than 40m up to 1Mbit/s is possible. Lengths of up to 1000m are possible with a rate of only 50 kbit/s. The maximum data rates for various network lengths are shown in the table below.</td>
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<tr>
<td>CAN-bus Network Length</td>
<td>Data rate</td>
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<tr>
<td>&lt; 40m</td>
<td>1 Mbit/s</td>
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<td>&lt; 100m</td>
<td>500 kbit/s</td>
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<td>&lt; 500m</td>
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<tr>
<td>&lt; 1000m</td>
<td>50 kbit/s</td>
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The physical layer is not well defined in the CAN-bus standards, although there are some suggestions. The most common connector for CAN-bus is a 9-pin Dsub. More recently RJ45 connectors have become popular because of their low cost and ready availability. The CAN-bus signal must be terminated with 120Ω at both sides of the bus.

CAN-bus has been an option available on WIENER VME crates since 1995. The pin layout used for RJ45 connectors is shown above. The CAN-bus option is now standard on WIENER 6000/195 series crates as part of the WIENER combination interface board. It is also available for PL5xx and Maraton power supplies, MPOD, and some CAMAC crates.

**CAN-bus Software: WINcRM**

WIENER has developed WINcrm, which is a small CAN-bus monitoring application for controlling WIENER VME crates. This program allows up to 127 crates to be monitored from a single location. WINcrm can be downloaded from [www.wiener-d.com](http://www.wiener-d.com) or by contacting your WIENER representative.

The screen shots below show the WINcRM software with a large number of crates connected. The top image is an over view screen showing all of the crates connected to the network. The lower image shows the details of one of the crates in from the overview.
from all connected devices and provides a way to access the data from an OPC client simply.
The server information is organized hierarchically. To access specific item a complete path must be provided. An example of the structure can be seen in image below.

There are several options for OPC client software; WIENER uses the Softing Client. The client communicates with the OPC to request information. The server translates the request into a hardware level command (CAN-bus or SNMP) and returns the results from the command. The screenshot below shows an OPC client reporting data back from a PLS12 power supply.

**Ethernet**
Ethernet is a large, diverse family of frame-based computer networking technologies for local area networks (LANs). Since many institutions already have an existing Ethernet infrastructure, it is often easy to connect to that infrastructure for monitoring.

WIENER 6000/195 series crates use Ethernet for monitoring in a number of ways. All WIENER 6000/195 series crates and MPOD come with an Ethernet interface by default as part of the combination interface board. It can optionally be added for PLS08 and PLS12 power supplies.

The Ethernet interface supplies one 10/100Mbit/s port with RJ45 connector. The IP address can be obtained automatically via BOOTP/DHCP, or set manually via USB (PLS12 & MPOD) or a connected display (MPOD, VME crates). The interface can be accessed using a built-in web server or SNMP.

**Ethernet Software: Web Server**
All Ethernet equipped WIENER products have a built-in web server for easy monitoring capability. The biggest advantage of this interface is simplicity, since it doesn’t require any extra software to be developed or installed. To access the web server simply type the ip address of the crate or power supply you wish to monitor into any modern web browser (Internet Explorer, Firefox, Opera, etc.). The following picture shows the monitoring page for crates / PLSxx power supplies.

The function buttons, which allows the main power to be cycled, VME sysreset sent, or fan speeds to be changed, are all password protected to prevent unauthorized access.

Also MPOD low and high voltage power systems can be monitored via the web interface however; there are no control functions provided.

**Ethernet Software: SNMP**
Small network management protocol (SNMP) is an open standard used to monitor and control network devices. SNMP is commonly used to monitor the health of network switches, routers, printers, firewalls, etc. It is also well
suited for monitoring and controlling WIENER crates and power supplies.

For every SNMP device a MIB file exists that provides a textual name for each parameter the device provides. For WIENER products all parameters are included in the WIENER-CRATE-MIB.txt file. In the case of the VME/VXI crates this includes fan speeds, power supply configuration, power supply status, and control bits. In addition the PLSxx and MPOD allow control of ramp speeds.

There are several software packages for interacting with SNMP devices and many different ways it can be done. WIENER suggests the use of the netSNMP open source library. This package provides C/C++ and command line interfaces. In addition WIENER has developed and makes available a small sample C++ library for working with WIENER devices. For MS Windows DLL libraries are provided. Also Labview VI’s have been developed based on SNMP.

Web based monitoring and control applications are possible by using SNMP functions offered by PHP. This solution is very flexible and allows a custom application to be designed with minimal effort. The screenshot below shows a small example application for monitoring voltages and fan speeds from a single crate.

Using PHP it is possible to develop applications that monitor/control many parameters of an unlimited number of crates. However it is important to remember that a web based application can open up many security risks and that should be considered when deciding what type of control interface should be used.

The SNMP objects available for W-IE-NE-R crates are divided into four access level groups, and different privileges are necessary for access. So it is possible to allow view-only access to one user group, and full access to others.

Ethernet Software: OPC Server.
The OLE Process Control (OPC) standard was first specified in 1996 to provide a unified API for the monitoring and control of many different types of devices. A WIENER developed OPC server is available and is capable of using either CAN-bus or Ethernet interfaces.

Ethernet Software: SNMP Labview
In an effort to make integrating WIENER devices in to a setup easier, WIENER has developed, and makes freely available, Labview VIs that can be used to monitor or control a WIENER VME crate or PLSxx power supply. With these VI’s a group that commonly uses Labview can quickly add monitoring information to the data stream and make remote power cycling easy to accomplish. Below is a control panel built of these VIs that shows possibilities for remote monitoring and control.

Serial
The WIENER combination interface, which provides CAN-bus and Ethernet control, also provides a serial interface for maintenance. The serial port uses a RJ45 connector with the pin out shown below.

This serial port cannot be used for remote monitoring but is used mostly for firmware upgrades. The 6000-Series crates allow access of this port via the TELNET protocol, e.g. to get BIOS control or catch boot log messages of VME cards.

USB
Universal Serial Bus (USB) is one of the fastest growing communication protocols used today. This makes it ideal for a control bus since most modern computers have several USB ports and extras are easy to add. However, USB is limited to 10m before additional measures are needed.

USB2.0, the most recent revision, added USB high speed that is capable of up to 480Mbit/s. However this is only possible when transferring large data blocks. For system monitoring, the time for a small transfer is more important. The USB cycle timing varies by operating system but around 400µs is typical. This limits USB monitoring to 2.5kHz.

USB interfaces are available on WIENER PLSxx power supplies and RCM (maraton) control modules. Additionally WIENER offer VME and CAMAC crate controllers with a USB interface.

USB Software: MuseControl
MuseControl is a WIENER developed program for control, setup and monitoring of WIENER USB equipped power supplies. It can also be used to setup the network interface so that Ethernet control can be used in the future.
Network configuration with MuseControl

The figure below shows the output configuration screen of museControl. This screen allows the user to easily adjust channel parameters and trip points.

Troubleshooting/configuration Interface

One of the most powerful features of WIENER power supplies is the ease of troubleshooting and configuring. This is particularly important for our 6000 series VME crates.

For troubleshooting and configuration a serial interface is used. However, it is necessary to build a small adapter, below, to separate the serial Rx, Tx, and ground lines as well as protect your PC from being damaged.

UEP6000 software

WIENER provides the UEP6000 software as a way to troubleshoot and configure your power supply, shown below. Some of the data shown in the UEP6000 software is write protected to protect the power supply calibration. However some parameters, such as nominal set points, are not write protected and could lead to serious damage of they are adjusted carelessly.

From the UEP 6000 software it is possible to change most of the parameters of a power supply including set points, Vmax, Vmin, Imax, and TEMPmax.

WIENER Interface Software Summary
CML 01 - Control, Measurement and Data Logging for Customized Slow Control

The Control, Measurement and Data Logging system (CML) is designed to add remote control and monitoring functionality to electronic systems.

Analog measurement is done with a fast & high precision 12 bit AD converter. The 24 analog input channels are configured to measure 8 voltages, 8 current-proportional voltage signals and 8 temperature probes. If current shunt signals are not used, these inputs may be used as general purpose analog inputs.

The integrated supervision system compares all measured voltages with a minimum and maximum value and the currents, temperatures and with a maximum value. Exceeding the supervision threshold can switch off the system.

Fan speed measurement and speed control of up to 9 fans is provided. The fan supply voltage is generated on board, so no special fans with PWM input are required. Up to 3 fan groups can be regulated individually.

If the fans are supplied by a separate power supply, a follow-up time can be set and the system can be cooled down after power off. If the CML is supplied by an external power source, it is possible to switch the main system power supply on or off with the on/off switch or via network.

Features:
- Voltage: 8 differential inputs, 12 bit ADC
- Temperature: 8 inputs (semiconductor sensors)
- Universal V / I: 8 differential inputs, 12 bit ADC
- Digital inputs: 14 TTL
- Digital outputs: 16 TTL/LED driver, 4 open collector
- Fan Control: 9 fans monitored, fan speed settable (no PWM signal necessary)
- Fully controlled, programmable trip thresholds (min./max. voltage, max. current, power, temperature)
- Generation/Detection of VME/cPCI RESET, AFAIL
- Ethernet connection IEEE 802.3 10BASE-T and IEEE 802.3u 100BASE-TX
- WWW-Server integrated, full control via SNMP protocol
- ON/OFF switch, VME/cPCI RESET button and multi-color LEDs at the front panel
- PC-Control (connected to galvanic isolated USB) with free available software
- IP address static or dynamic via DHCP
- Firmware update possible via USB or Ethernet
- Different security access level
- OPC server available
- Automatic data logging on Windows/Linux PC possible
- Optional alphanumeric display
- RS232 & I2C interface for connection of other devices to the system
- Optional CAN-bus (galvanic isolated)
- Digital Signal Processor (DSP) for real-time processing of all measured data
- Powered by 5V bus voltage or separated supply

All necessary functions are implemented on a small (100mm x 120mm) board. The system connections are provided on a 2mm high density connector.

For standard backplanes (e.g. VME) specific adapters are available.

The CML/adapter combination can be inserted into a VME slot like a standard VME module. All necessary bus connections are satisfied, and additional I/O signals are available at the unused pins of P2 row A and C.

An optional alphanumeric display module can be connected to the CML. With this display all measured values can be visualized, and system settings can be changed.

CML01 module (3U) within 6U VME adapter card.