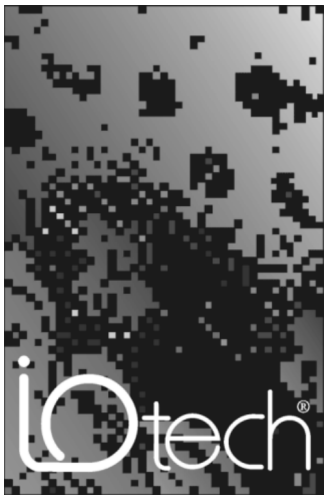
LogBook User's Manual

Stand-alone, Intelligent PC-Based Data Acquisition Systems

- ***LogBook/300***
- ***LogBook/360***



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Stand-alone, Intelligent PC-Based Data Acquisition Systems

p/n 461-0901 Rev. 4.0

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In this manual, the book symbol always precedes the words "Reference Note." This type of note identifies the location of additional information that may prove helpful. References may be made to other chapters or other documentation.

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Note: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

PDF
461-0901

LogBook User's Manual

Contains an overview, setup and startup instructions, and details regarding LogBook hardware. The following PDFs are companion documents.

PDF

LogView

Discusses how to install and use the *LogView* "out-of-the-box" data acquisition program.

PDF

Post Acquisition Data Analysis User's Guide

Contains at least one user's guide that pertains to a post acquisition-data analysis program. DIAdem and the set of eZ-Analyst view programs are examples of post data analysis applications.

PDF
457-0905

DBK Option Cards and Modules User's Manual

The DBK Option Cards and Modules Manual discusses each of the DBK products available at the time of print.

Your order was carefully inspected prior to shipment. When you receive your system, carefully unpack all items from the shipping carton and check for physical signs of damage that may have occurred during shipment. Promptly report any damage to the shipping agent and your sales representative. Retain all shipping materials in case the unit needs returned to the factory.

Manual Layout

Chapter 1 – ***An Introduction to LogBook*** discusses LogBook basics and highlights operational features. The last part of the chapter contains product specifications.

Chapter 2 – ***LogBook/300 Installation***

Chapter 3 – ***LogBook/360 Installation***

Chapter 4 – ***System Expansion*** discusses the expansion of LogBook systems in regard to LBK and DBK options. Power considerations and pinouts for P1, P2, and P3 DB37 connectors are also included.

DBK Basics (document module) – discusses option cards and modules (DBKs) that can be used to enhance and expand data acquisition systems. Note that *DBK Basics* is not a chapter, but an independent document module that is applicable to this user's manual, as well as others.

Chapter 5 – ***LBK and other non-DBK Options*** discusses the RS-422/485 Communications Card, memory expansion, remote LogBook Terminal, four-channel Digital-to-Analog Output card, GPS support, Modem Support, Upload Scheduler, and three options regarding a remote on/off switch and LED indicator.

Chapter 6 - ***CE Compliance*** pertains to CE standards and conditions relevant to LogBook systems.

LogView (document module) - is a reference document for the "out-of-the-box" data acquisition software known as *LogView*.

Error Codes. This sheet contains two lists of error codes; one for *LogView* software and another LogBook hardware.

Dimensional Drawings – Contains basic dimensional drawings that apply to LogBook/300, LogBook/360, DBKs, and other data acquisition devices.

Glossary

Reference Notes:
During software installation, Adobe® PDF versions of user manuals are automatically installed onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the Windows Desktop.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of manuals can be ordered from the factory.

- LogView – explains the use and features of the included "out-of-the-box" data acquisition software application.
- Post Acquisition Data Analysis User's Guide – contains one or more documents regarding post-acquisition analysis programs. For example, the guide may discuss the multi-tiered eZ-Analyst program and its lower-level components, or another independent application, depending on the level of product support that was offered at the time of purchase.
- For detailed information regarding specific DBKs, refer to the DBK Option Cards and Modules User's Manual, p/n 457-0905. Each DBK section includes device-specific hardware and software information. The document includes a chapter on power management.

Check the **`README.TXT`** file for information that may not have been available at the time this manual went to press.

Table of Contents

DBK Basics (Document Module)

Chapter 5 – LBK and other non-DBK Options

Chapter 6 - CE-Compliance

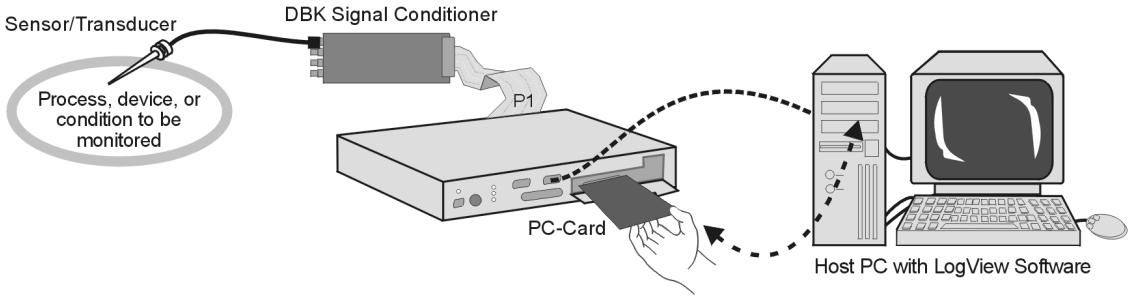
LogView (Document Module)

An Introduction to LogBook 1

LogBook Basics

What are LogBooks?

LogBook/300 and LogBook/360 are PC-based data acquisition systems that can work in a *stand-alone mode* (no PC present), or linked to a PC. They combine onboard intelligence with a removable PC-Card that stores the configuration file and the collected data. LogBooks have many options, most of which are detailed in the LBK chapter, and in the DBK Option Cards and Modules document. Note that the PC link can be by serial or parallel port.

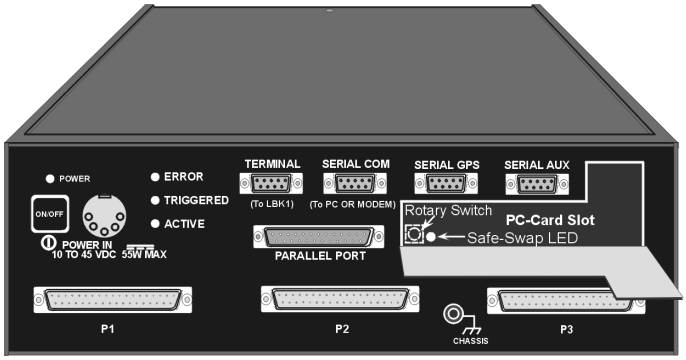


LogBook/300, Simple System Setup

The PC-Card holds the configuration file [created by *LogView*]. The file tells LogBook how to perform a particular acquisition. The PC-Card also holds the acquired data files. The PC can upload to or download from the PC-Card by cable if the PC is attached to LogBook, or by physical transport of the PC-Card from one unit to the other. Multiple configuration files and multiple PC-Cards allow the system to handle complex data acquisition environments with a large number of data-files.

Front and Rear Panels

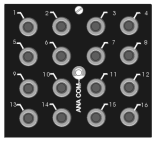
Note: Descriptions of panel items appear on the following page.



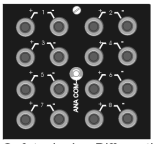
LogBook/360, Front Panel

Blank Panel
DBK601

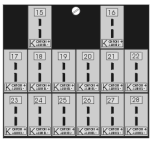
BNC Connectors
plus Analog Common
DBK602



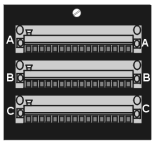
Safety Jacks, Single-ended
plus Analog Common
DBK603



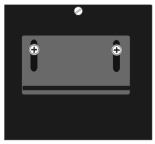
Safety Jacks, Differential
plus Analog Common
DBK604



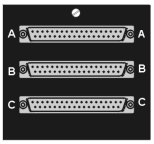
T/C Connectors, Differential
DBK605-B DBK605-R
DBK605-J DBK605-S
DBK605-K DBK605-T



Terminal Blocks,
16 connections each
DBK606

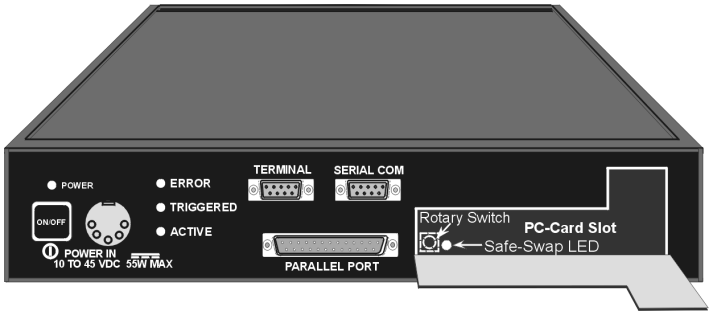


Strain Relief Clamp
DBK607



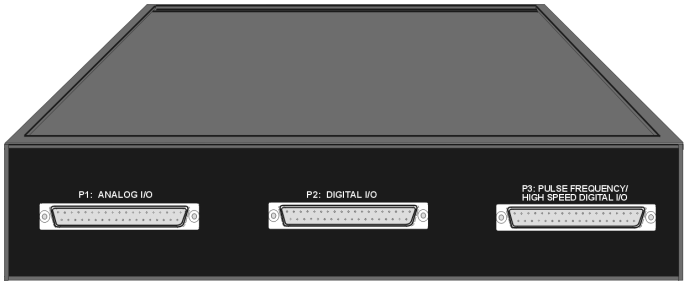
DB37 Connectors, Female
DBK608

LogBook/360, Terminal Panels (A combination of 3 make up the rear panel)



LogBook/300, Front Panel

Note: In earlier models, the PC-Card Door has a right-edge hinge (not shown).



LogBook/300, Rear Panel

LogBook/360 panel items are listed in the following table. Note that LogBook/300 panel items are the same as those on the 360, except as called out in the following bulleted list:

- Slight differences in the overlay.
- P1, P2, and P3 appear on LogBook/300's rear panel.
- LogBook/300 has no SERIAL GPS connection.
- LogBook/300 has no SERIAL AUX connection.
- LogBook/300 has no CHASSIS grounding post.
- LogBook/300 does not make use of Terminal Panels.

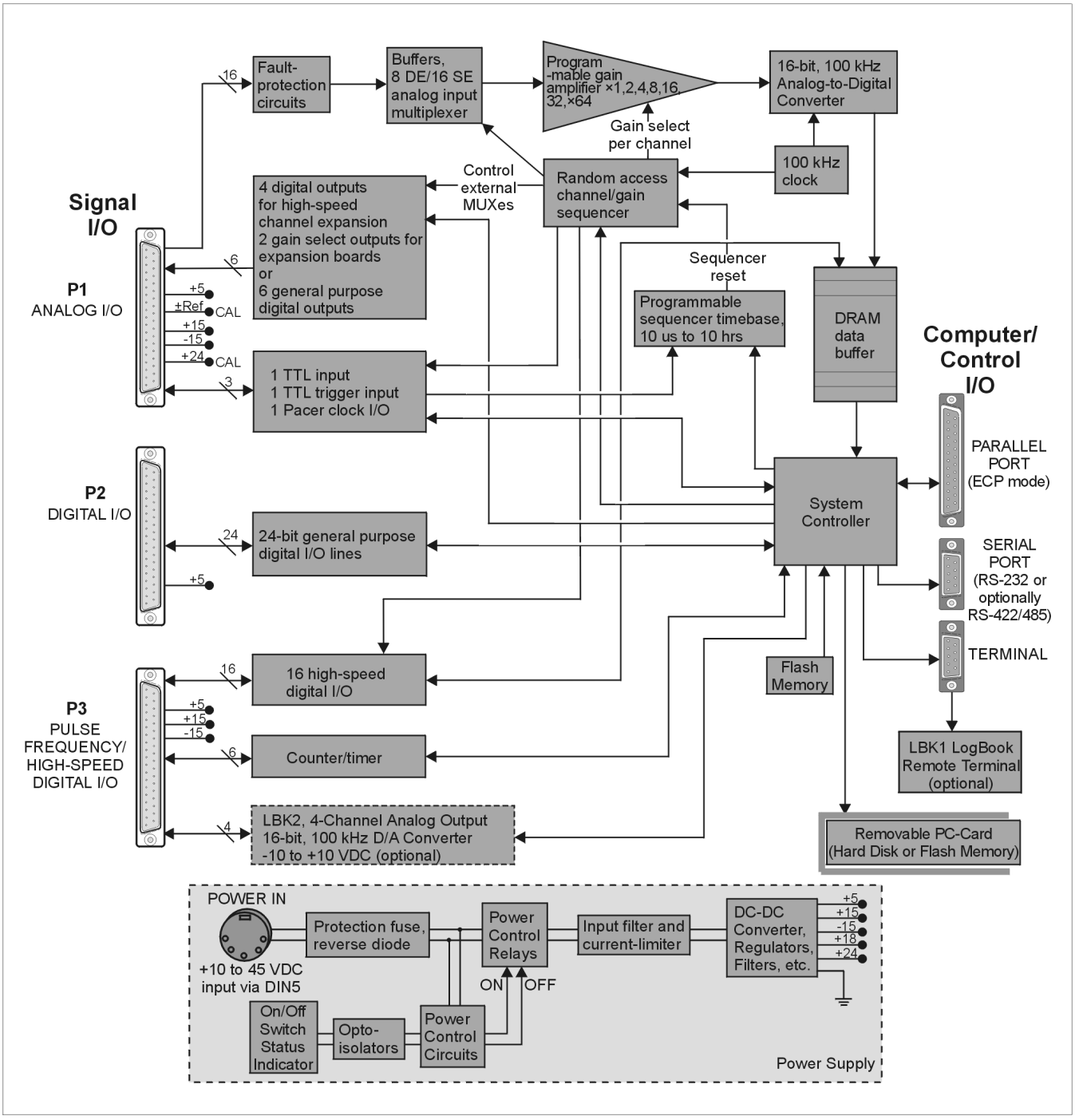
Switches	
ON/OFF	Depressing the push-button switch turns the power on.
(interior rotary switch)	PC-Card door provides access to a rotary switch to set device address when used in an RS-485 network.
Connectors	
POWER IN	This locking DIN5 input connector accepts +10 to +45 VDC.
PARALLEL PORT	This DB-25 plug is a parallel port connector to a host PC (set to ECP mode)
TERMINAL PORT (TO LBK1)	This DB-9 socket is a serial port connector for the LBK1 remote control panel (user-interface terminal).
SERIAL COMM (TO PC OR MODEM)	This DB-9 male serial COM port connects to a host PC or modem.
SERIAL GPS (LogBook/360 Only)	LogBook/360 only. This DB-9 male serial port option connects to a Global Positioning System.
SERIAL AUX (LogBook/360 Only)	LogBook/360 only. This DB-9 male serial port option connects to optional auxiliary devices.
P1 - ANALOG I/O	Provides 16 analog input channels, 3 TTL inputs, and various signals for driving expansion cards.
P2 - DIGITAL I/O	Provides 3 8-bit TTL programmable I/O ports and external interrupt input.
P3 - PULSE FREQUENCY / HIGH-SPEED DIGITAL I/O	Provides 4 16-bit counters, 4 analog outputs, and 16 high-speed digital I/O.
(PC-Card door, no label)	Door provides access to PCMCIA connector—for removable PC-Card memory devices.
Indicator LEDs	
POWER	LED lights when power is applied to LogBook and the power switch is depressed into the ON position.
ERROR	LED lights steady ON when a routine error occurs (e.g. disk full).
	LED flashes for fatal errors; refer to *Hardware Errors* near the end of the manual. No data can be acquired until the error is cleared.
TRIGGERED	LED lights after trigger event and during an A/D scan sequence.
ACTIVE	LED lights to show that LogBook is ready to begin a scan at the next trigger event.
Safe-Swap Light (interior green LED)	LED lights when it is safe to swap PC-Cards.

Highlight of Features

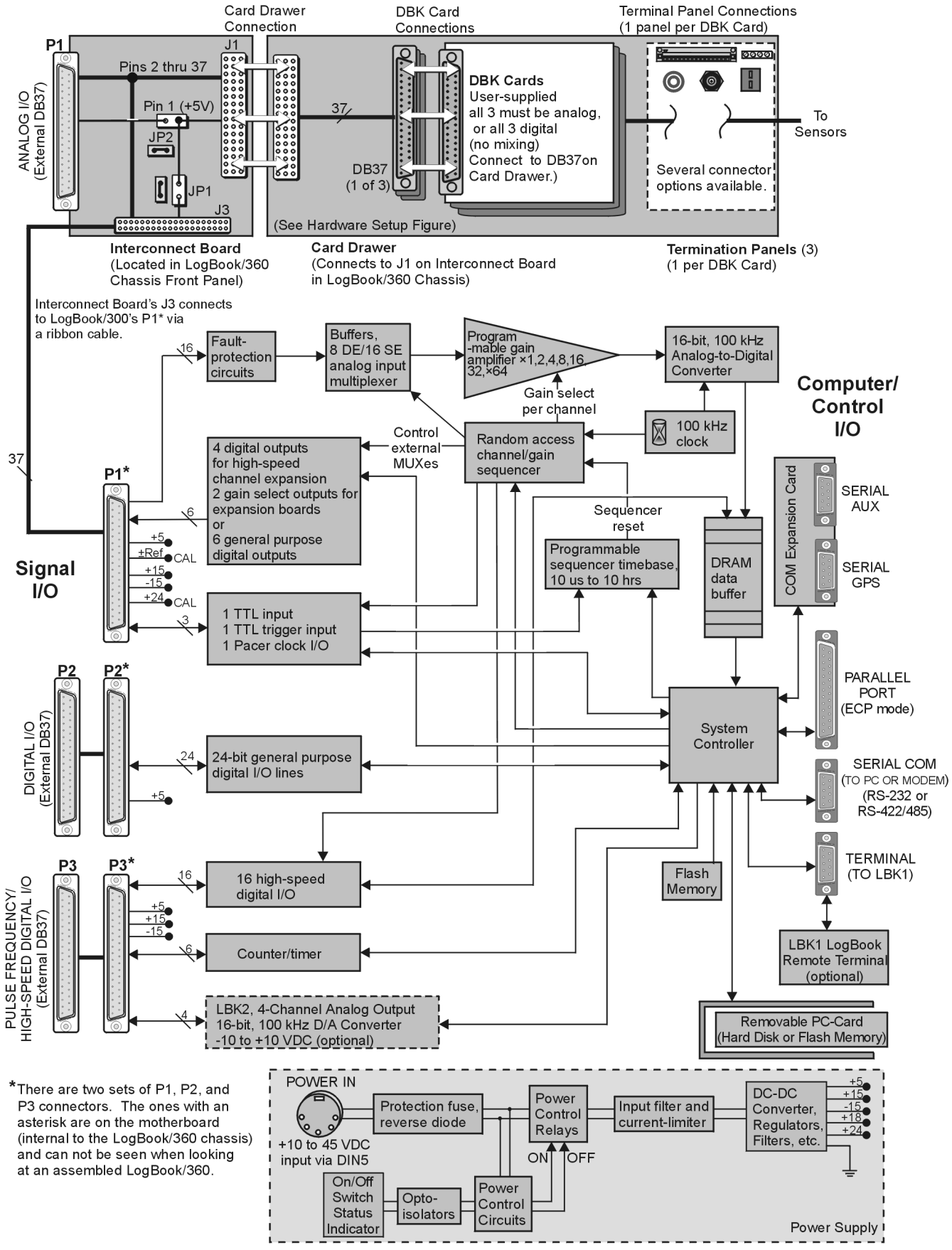
LogBooks can be left unattended for long testing periods and used in environments not suitable for PCs. With the use of PC-Cards, one PC can support several LogBooks. Other LogBook features include:

- Onboard processor capable of real-time data reduction and system control in stand-alone mode
- Non-volatile storage of configuration files and samples via removable, transportable PC-Cards
- 4 MB RAM onboard, expandable to 16 MB
- 100 kHz 16-bit Analog-to-Digital Conversion
- 8 differential, 16 single-ended inputs; expandable to 256 input channels via DBK cards
- 7 gain/input ranges, unipolar and bipolar
- 40 digital I/O lines, expandable to 208
- 4 pulse-counting inputs
- Gain and unipolar/bipolar settings are programmed in real time (10 µs max)
- Scan-sequence memory (1024 analog channels plus 128 digital channels) for any combination of channels/gains
- Input power: 10 to 45 VDC (AC adapter included)
- LBK options
- DBK options

LogBook/300 Block Diagram



LogBook/360 Block Diagram



*There are two sets of P1, P2, and P3 connectors. The ones with an asterisk are on the motherboard (internal to the LogBook/360 chassis) and can not be seen when looking at an assembled LogBook/360.

The following components are represented in the previous block diagrams. Certain items apply only to LogBook/360, as noted.

- **Removable PC-Card**. A 12-520 MB capacity holds the software, operating system, user configurations and the acquired data. The PC-Card is at the center of LogBook operations. A PC-Card [pre-programmed by LogView] ensures an unattached LogBook comes up properly.
- **Power Supply**. The internal power supply accepts an input of 10 to 45 VDC and supplies filtered regulated voltages to its internal circuits and to accessories connected via P1/2/3. An external AC to-DC adapter for all standard voltages is included with the system.
- **System Controller**. A microprocessor chip is used within LogBook with either 4 MB (standard) of RAM or 16 MB (optional). A field-upgradeable 512 KB Flash memory is used to store the system startup code, self-diagnostics, and Field Programmable Gate Array (FPGA) configuration. The FPGA controls every LogBook operation, including real-time control. By using Internal flash memory instead of EPROMs, field upgrades of virtually all functions [including FPGA circuitry] are possible. Most software will be read from the disk drive.
- **Analog Input** via **P1**. 16 main channels that can each accommodate 16 sub-channels via multiplexing for a total of 256 analog input channels. Fault protection and buffer circuits prevent overloads and cross-channel noise due to impedance mismatch.
- **A/D Converter**. The A/D converter uses 16-bit resolution @ 100 kHz sample rate.
- **Digital I/O**. 16 high-speed digital inputs via **P3**, three 8-bit TTL programmable I/O ports via **P2**, three TTL inputs via **P1**. Note that LogBook/360 has P1, P2, and P3 connectors on the motherboard that are connected [by ribbon cable] to secondary P1, P2, and P3 connectors [located on the chassis front panel]. LogBook/300's P1, P2, and P3 are located on the rear panel.
- **LBK2 Analog Output** (***optional***): This option provides four channels of analog output, 16-bit @ 100 kHz @ ±10 VDC.
- *LogBook/360 only*, **Interconnect Board**, **Card Drawer** (for three DBK cards), and three **Terminal Panels**.
- **Computer/Control/I/O** – Includes: PARALLEL PORT (ECP Mode), SERIAL PORT (for RS-232 or RS-422/485), TERMINAL PORT (for LBK1 LogBook Remote Terminal option). In addition, for *LogBook/360 only*, there is a COM Expansion Card with two serial ports (SERIAL AUX and SERIAL GPS). These two ports are for connecting auxiliary serial devices, such as a Global Positioning System.

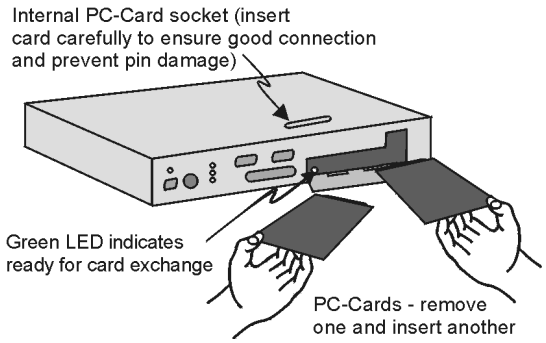
The Use of PC-Cards with LogBook

After the initial setup, you can interact with LogBook via PC-Cards. A safe-swap LED (inside the PC-Card access door) lights when it is safe to change PC-Cards. You can also interact with LogBook using the LBK1 Remote Terminal Panel option (discussed in the LBK chapter). The **LBK1** option provides limited LogBook control without use of the *LogView* program. As can be seen from the following PC-Card Compatibility information, some PC-Cards should be avoided in regard to use with LogBook.
Note: during operation, *LogView* is the primary system interface for control and configuration.

PC-Card Compatibility with LogBook Operation

To work properly, the LogBook requires compatible PC-Card memory. You can purchase 100% compatible cards through your LogBook sales representative. If you prefer to buy your card from another source, make sure it is an ATA-style memory card. Also, make sure the card's memory capacity is sufficient for your purpose.

You can change PC-Cards to load setup files, replace full cards, or transport data to an unattached PC. When the PC-Card door is opened, a detector starts a preparatory routine to clean up files on the installed disk. Within a few seconds, a green LED indicates it is safe to swap PC-Cards. Swapping should be done quickly to prevent gaps in the recorded data. 4 MB RAM provides about
10 seconds at 100 kHz and 1.75 minutes at 10 kHz. 16 MB RAM provides over a minute at 100 kHz and about 12 minutes at 10 kHz for one-channel scans.



Swapping PC-Cards in a LogBook/300

Note: Some models have PC-Card doors with right-edge hinges (not shown).

- Swapping time is measured from when the door opens. **Keep door closed unless you are in the process of swapping cards.**
- PC-Cards must be pre-configured by LogView—if anticipating the need for multiple cards, **download the exact SAME ACQUISITION SETUP FILE to each PC-Card**.
- The PCMCIA slot accepts a Type I, II, or III hard-disk card or ATA flash-memory solid-state card.

Reference Note:
Additional information regarding PC-Cards can be found in this chapter, on pages 1-9 and 1-10; and in the LogView document module.

System Software

LogBook software includes *LogView*, *Upload Scheduler (optional)* and a post acquisition data analysis application. Examples of the later are DIAdem, PostView, and eZ-View. *LogView* and the post data analysis program are discussed in independent document modules. PDF versions of the documents are loaded on to your computer's hard drive during software installation. The default location for the files is the **Programs** directory, which is accessible from the Windows DeskTop. The *Upload Scheduler* is discussed in the following LBK chapter. A synopsis of each application follows.

- ***LogView*** is a ready-to-use Windows-based program for data acquisition and logging. The program provides a means of selecting channels, gains, transducer types, and various parameters. After setting up the configuration on the PC, you must download the configuration file to LogBook's PC-Card. LogBook then uses the PC-Card to start the pre-configured acquisition. During an acquisition, LogView can display channel values on its Graphical User Interface in the form of a spreadsheet, bargraph, analog meter, or digital indicator. LogBook data can be uploaded to your PC in various data formats (Excel™, SnapMaster™, MATLAB™, DASYLab™, Lotus®, Quattro, and ASCII) for compatibility with virtually all post-acquisition analysis software.
- ***Upload Scheduler*** is an application that exists as part of the LogBook/Modem option. *Upload Scheduler* allows you to configure upload events for one or more LogBooks. A scheduled event can be configured to execute one time, or periodically, with no post-configuration intervention by the user. The *Upload Scheduler* is detailed in the LBK chapter.
- **Post Acquisition Data Analysis programs** provide a means of viewing and analyzing data via interactive graphics. Refer to the document module for detailed information.


Notes

Operational Features

Data Acquisition Overview

Note: Acquired data is signal-conditioned before it is logged (recorded by LogBook). The data can be post-processed via analytical programs.

A **Sensor/Transducer** reacts to a physical quantity (such as stress, strain, frequency, temperature, acceleration, light intensity, etc) and encodes that quantity into an analogous electrical signal. A wide variety of transducers produce signals that vary in type and strength—some generate a voltage; others alter an electrical property. As the measured condition changes, the analog sensor signal can vary directly or inversely and in a linear or non-linear way.

Although LogBook can read volts directly, many sensor types still require signal conditioning before they can be correctly interpreted.

The **Signal Conditioner** changes the raw transducer signal into a voltage for use by LogBook's **Analog-to-Digital Converter (ADC)**. Depending on signal quality, several steps may be involved (e.g., linearization, isolation of high voltages, amplification of weak signals, attenuation of strong signals, filtering of noise and irrelevant frequencies, differential voltage measurement, simultaneous sample-and-hold, and pulse/current-to-voltage conversions). DBK option modules are designed for conditioning a particular type of transducer signal. The signal conditioner's output voltage range is "normalized" to a user-selected range for the measured values.

Note: Multi-channel DBKs can multiplex several input signals into one of LogBook's 16 main inputs. **Multiplexing** up to 16 analog channels for each LogBook main channel **allows system expansion up to 256 analog input channels**.

LogBook's onboard **microprocessor** and **PC-Card** allow it to operate independent of a host PC. Functionally, LogBook can perform:

- **Analog-to-Digital Conversion.** The ADC changes a conditioned analog signal to a corresponding digital value. LogBook's 16-bit ADC uses 65,536 numbers (2^{16}) to quantify values within the specified range and gain. Each input channel's buffer amplifier ensures constant input impedance. The buffers also eliminate any noise effects from multiplexing of the input signals.
- **Acquisition Control.** The microprocessor controls the data acquisition by managing trigger conditions, gains, offsets, scan sequencing, and data formatting. LogBook can continuously collect information, or be used for exception-capturing (with triggers). Pre-trigger and post-triggers allow for capture of specific data, thus making more efficient use of memory.
- **Analog and Digital I/O**. With the standard digital I/O, standard analog input, and the optional analog output board, LogBook can perform virtually any data acquisition task as well as more complex tasks for alarm and control systems.
- **Data Logging**. Data can be saved in one of several formats and later downloaded to a PC.
- **Communication with PC.** LogBook provides for serial and parallel port communication. In the stand-alone mode, the PC-Card must be manually transported between the PC and LogBook.

The **PC-Card** is a memory device (rotating or flash, PCMCIA types I, II, or III)) that holds the system software and the acquired data in multiple formats. System software includes the configuration file that directs a specific acquisition and LogBook's operating system. The PC-Card as programmed in LogView allows LogBook to operate without PC intervention if so desired. LogView can configure a PC-Card in LogBook if the PC and LogBook are electronically connected via serial or parallel port. In a stand-alone mode, the PC-Card must be physically transported between a PC with LogView and one or more LogBooks for uploading and downloading. Using a 500-Mbyte PC-Card, for example, you can store up to 250 million samples in non-volatile memory; that equates to more than forty minutes of recording time on one channel at the full 100 kHz acquisition rate. For continuous data collection, PC-Cards can be swapped while the acquisition is taking place. As one card becomes nearly full, it can be removed and another card inserted without causing a gap in the acquired data.

The **user's PC** (typically a laptop or desktop) runs the supplied **LogView** software. LogView's user-interface includes a virtual instrument panel with meters and controls to fit various applications. Through LogView you can configure the system, apply further data processing, or manage multiple LogBooks. LogView stores data in a conventional format so that other software can use the acquired data for analysis, control, alarms, reporting, etc.

Note: The PC can be attached to LogBook via a serial or parallel connection; alternatively in the stand-alone mode, the PC can be *un*attached and communicate with LogBook via a PC-Card that is manually transferred between the PC and LogBook.

LogBook System File

The file **`logbook.sys`** is LogBook's operating system. Without it, LogBook will not work; without it on LogBook's internal PC-Card, LogBook will not power-on. After software is installed [as discussed in the Quick Start sections] the 500-KB **`logbook.sys`** file will reside in the *LogView* folder (on the hard drive of the host PC). To be used by a LogBook, **`logbook.sys`** must have already been downloaded to the PC-Card inside LogBook.

Downloading. When LogView downloads the **`*.lvc`** acquisition setup file to a PC-Card, it checks to see if the current release version of **`logbook.sys`** is already on the PC-Card. If so, fine; if not, **`logbook.sys`** must also be downloaded to the PC-Card. Thus, downloading to a PC-Card that is being used for the first time will take longer than subsequent downloads.

Failure to upgrade to the current release version of `logbook.sys` can result in software glitches. This problem can be resolved by reformatting the PC-Card using Windows Explorer's File/Format feature, and then reinitializing the PC-Card.

Due to the file size and relative transfer time, insert first-time PC-Cards into the PC's card socket rather than LogBook's. Downloading via the PC's socket takes only a few seconds; however, using LogBook's socket and a communications channel will take much longer (about 7 minutes at 9600 bps).

Regarding the `logbook.sys` file and Power Loss. After LogBook is started, it can store data to a PC-Card that does not have the **`logbook.sys`** file. However, in this case if LogBook loses power *it will not be able to restart!* LogBook will restart when powered-on with a PC-Card that does have the **`logbook.sys`** file.

Because LogBook needs the `logbook.sys` file to become operational after loosing power (due to an outage or being turned off), keep the `logbook.sys` file on all PC-Cards that will be used for data storage.

Communications

Protocols

LogBook uses only standard, supported, widely available communication channels to minimize device-driver development. The messages transmitted over these channels are also standard: human-readable ASCII for commands and status, and standard file-transfer protocols (such as X-modem) for block data transfers. The messages and protocols are independent of the choice of communication channel, except when a channel explicitly requires a different protocol (such as FTP over TCP/IP). The use of such standards makes LogBook easier to use and extend.

To implement these standards, LogBook includes a command parser and conversion software to convert measured voltages into physical measurements such as temperature, force, or acceleration. This software is used for monitoring transducer measurements, both at the PC and the LBK1. LogBook can return all data as physical quantities and/or raw voltage measurements.

Large blocks of raw or converted data (such as entire acquisitions or a set of consecutive scans) are transferred as binary files, using file-transfer protocols. Smaller blocks (such as individual readings or scans) are transferred in readable ASCII.

Parallel Port – ECP Mode

LogBook includes an ECP parallel port for high-speed local communication with a PC in the ECP mode (the only supported protocol is ECP). Your PC mode may need to be changed in its BIOS or in the Window Settings—consult your PC's documentation or the PC's manufacturer as needed.

Serial Port

LogBook includes an RS-232 (RS-422/485 optional, call factory for availability) serial port supporting both point-to-point and multi-drop remote communication.

Other Communication Channels

The serial communication protocols are standard so non-PC hosts can communicate with LogBook. The use of printable ASCII for commands and status and the use of standard file-transfer protocols make it practical to add additional ports such as USB, IEEE 488, TCP/IP. Consult factory for availability of these communication options.

Triggering and Scan Timing

Reference Note: For information on defining triggering conditions through *LogView*, refer to the *Acquisition Configuration* text and screen shots, which are provided in the LogView document module.

If data collection is desired only under specific conditions, you can specify appropriate trigger conditions. By defining a trigger, pre-trigger, and post-trigger, you can collect data surrounding a specific event. This event can be an absolute time or a defined condition such as a particular analog channel measuring a certain quantity. If a calculated channel is chosen as the trigger source, you have greater flexibility in defining the trigger based on multiple inputs and conditional logic. An auto re-arm feature allows many successive acquisitions to take place automatically, with each acquisition using the same settings.

LogBook can be triggered by several types of sources, including analog and digital triggering, multi-step triggering, multi-channel triggering, time-of-day triggering, and manual trigger. The manual trigger can be implemented in the following ways:

- With a computer attached, you can trigger LogBook from LogView's LogBook Monitor window.
- Without a computer, you can use a manual trigger switch by attaching it to the TTL trigger input (pin 25, on P1).
- With a logic device you can engage the TTL trigger on P1's pin 25, as programmed.
- Without a computer, you can use the LBK1's manual trigger button.

LogBook time-of-day clock has 1/256-second resolution for data-logging applications where acquisitions must be performed at specific times during the day. The time of occurrence of each acquisition and its trigger are also recorded with the data. The scan-to-scan timing may be set by a fixed-frequency pacer clock. Or, an external clock can start each scan individually to allow the scan rate to track a variable-speed event (such as engine revolutions).

Note: Time-stamping is done in 1/256-second units; but the absolute trigger is in 1-second units.

For data acquisition applications that include both fast and slow signals, multiple sample rates can be configured. In the acquisition setup dialog box, a primary acquisition rate and divisors for up to 3 more rates can be configured. Using multiple sample rates, fast signals like vibration can be sampled at a high rate while slow signals like thermocouples are sampled at lower rates, optimizing the system's storage capacity.

Scan Rate Limitations

LogBook's internal clock runs at 100 kHz, and this is the fastest scan rate possible with just one input channel in the scan list and no outputs. As input, calculated, and output channels are added to the scan list, the usable scan rate is correspondingly reduced. The system does not automatically compute an optimum scan rate for you. However, LogView will generate an error message in the LogBook Monitor window if timing problems occur, and the following sections explain such problems and how to solve them.

External TTL Trigger and Stop Events

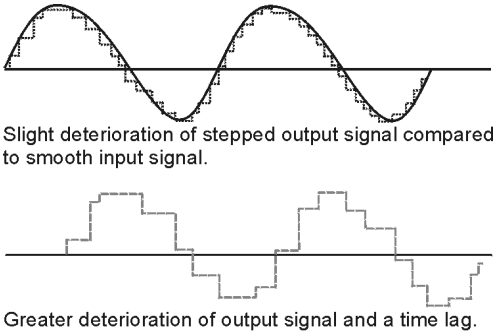
An external TTL trigger can repeat before the trigger block completes; extra trigger signals will be ignored. Likewise, multiple stop signals received before restarting the next scan will be ignored. Such ignored signals are noted in the LogBook Monitor window as "Losing Trigger Events" and "Losing Stop Events".

Problems Arising From Too Fast a Scan Rate

If the user-specified scan rate does not provide enough time to complete the necessary tasks of the entire scan list, various problems can occur. Bear in mind that LogBook places the highest priority on reading input channels—it is primarily a data logger. Also realize that calculated and output channels are based on input channels and come typically at the end of the scan list. Thus, if the scan rate is too fast and the next sequence begins before the first is completed, the outputs may suffer. When outputs can't keep up with the inputs, possible consequences include:

- Missing/late Outputs. The outputs are not updated in a timely fashion and may not represent their sources in real time (LogBook Monitor error message is "Outputs Deteriorating").
- Missed Alarms. Digital alarm outputs may not be initiated soon enough—important alarms might never go off.
- Faulty Control. Control systems based on digital outputs or a DBK25 could fail if dependent on a fast critical response time.
- Distorted Outputs. Analog outputs may appear to be "jaggy" or other distortions such as aliasing-type errors.

Ideally, each output signal is based on one input, resulting in an accurate output waveform. Factors such as scan rate, number of output channels and calculated channels can overload the system, resulting in one output signal for multiple input scans. The resulting signal deterioration can increase over time and shows up as a distorted and/or lagging output signal. Such output errors can resemble aliasing errors where output signals are distorted from their input signals because the effective sampling frequency was not high enough (see figure).



Output Signal Deterioration

Solutions To Scan Rate Problems

To confirm a suspected timing problem with your acquisition, run the acquisition and then check:

- The LogBook Monitor window in LogView for a corresponding error message.
- Actual deterioration of outputs as described in the previous section.

To solve timing problems you may need to perform one or more of the following, in order of effectiveness:

- Choose a slower scan rate, or change the trigger parameters.
- Reduce the number of output channels.
- Reduce the number or complexity of calculated channels.
- Reduce the number of input channels.

Estimating an Optimum Scan Rate

Note: The scan rate can be measured **as a frequency** in Hz or kHz or **as a period** in ms or μs. These two measures are reciprocals of each other; e.g., 1/100 kHz = 10 μs.

Processing input channels is LogBook's highest priority; each input channel is collected at 10 μs. After all the inputs are collected, LogBook performs the necessary calculations and then updates the enabled outputs. The time to perform calculations and outputs varies with the type of calculation, and this makes it difficult to predict the exact length of time required. Simple calculations are done much faster than functions for non-linear thermocouples and RTDs or the use of logical and bitwise calculated channels. Output channels can take from 100 μs to 300 μs; so for very approximate results, we'll use 200 μs.

To *estimate* the maximum scan rate, use the following formula:

approximate scan period = (number of inputs × 10 μs) + (number of outputs × 200 μs)

If only 5 input channels are enabled, the scan period equals 50 μs with a frequency of 20 kHz. If one output channel is added, the period becomes 250 μs with a frequency of 4 kHz.

After running the acquisition, check the LogBook Monitor screen for error messages. A list of Software and Hardware-related error codes is included near the end of the manual.

Use of Outputs to Alarm and Control

Reference Note: For information on how LogView allows you to set outputs based on *user-defined* conditions, refer to the LogView document module's section entitled, *Calculated-Channel Configuration*.

By careful setup of LogBook's analog and digital outputs, you can control external devices and/or stimulate the unit-under-test. Using LogView's calculated channels, equations can be derived that can be used to stimulate digital outputs for use as alarms or for on/off control. For example, the equation:

DIG1 = (CH1 - CH2) < 2

turns on digital output "1" if the difference between channels 1 and 2 is less than 2.

The system's four 16-bit analog outputs can also be used for controlling or stimulating external devices. Using channel data derived from input channels and equations or canned waveforms, the analog outputs can be updated at rates as high as 100 kHz.

Acquisition

A selected acquisition can be armed:

- on command from the keypad or PC
- at power-on, or

After an acquisition, LogBook may continue the same or begin a new acquisition. The new acquisition can begin immediately, after a specified time interval, or at a specified time.

Data Storage and Retrieval

The quantity of acquired data can be reduced by **block averaging** or by **decimation** (skipping samples without averaging). Then, data is placed onto the DOS-compatible disk drive using a proprietary format in a DOS-compatible file. The acquisition setup name and a time stamp are also written to disk. Post-processing programs can thereby correctly interpret the related data.

The PC can retrieve the acquired data through the serial or parallel port, during or after the acquisition. Upon command from the PC, LogBook can switch to storing data into a new file. After the PC retrieves data [from the first file], it can erase that file and reuse the space.

Note: Data is never erased without a specific command from the PC.

Data can also be retrieved from a PC-Card. LogBook copies enough information from the old card to the new (replacement) card to make sure the current acquisition can continue on the replacement PC-Card.

Replacement PC-Cards for use with LogBook must be pre-configured in order to store acquisition data.


Notes

LogBook Specifications

General

Supply Voltage Range: 10 to 45.0 VDC
Power Consumption: 0.9 A @ 15 VDC
Operating Temperature: -40° to 140°F (-40°C to 60°C)
Storage Temperature: -40° to 176°F (-40°C to 80°C)
Humidity: 0 to 95% RH, non-condensing
PC-Card Memory: Standard ATA Type

LogBook/300:
Size: 8½ × 11 × 1¾ in. (216 × 279 × 44 mm)
Weight: 3.3 lb (1.5 kg)
LogBook/360:
Size: 14 × 11 × 3.5 in. (356 x 279 × 89 mm)
Weight: 7.3 lb (3.3 kg)

A/D Specifications

Type: Successive approximation
Resolution: 16 bit
Conversion Time: 10 µs

Monotinicity: No missing codes
Linearity: ±1 bit

Analog Inputs

Channels: 16 single-ended, 8 differential, expandable up to 256 differential; single-ended or differential operation is software programmable.

Connector: DB37 male, P1

Maximum Overvoltage: -35 V, +45 V

Input Current:

Differential: 0.4 µA typical, 0.7 µA max

Single-ended: 0.2 µA typical, 0.35 µA max

Input Impedance:

10 MΩ differential in parallel with 20 pF

5 MΩ single-ended in parallel with 30 pF

Calibration: Digital software calibration

Channel-to-channel Crosstalk: 100 dB

Ranges: Unipolar/Bipolar operation is software-programmable on a per-channel basis.

Unipolar:	**Error % of Full-Scale**	**Error Drift % of Full-Scale**
0 to +20 V	±0.01	±0.0004
0 to +10 V	±0.01	±0.0004
0 to +5 V	±0.01	±0.0005
0 to +2.5 V	±0.01	±0.0006
0 to +1.25 V	±0.01	±0.0008
0 to +0.625 V	±0.01	±0.0012
0 to +0.3125 V	±0.01	±0.0021

Bipolar:	**Error % of Full-Scale**	**Error Drift % of Full-Scale**
±10 V	±0.01	±0.0004
±5 V	±0.0004	±0.01
±2.5 V	±0.01	±0.0005
±1.25 V	±0.01	±0.0006
±0.625 V	±0.01	±0.0008
±0.3125 V	±0.01	±0.0012
±0.1563 V	±0.01	±0.0021

Triggering

Analog Trigger:

Programmable Level Range: full range of specified channel

Trigger to A/D Latency: 10 µs max

Digital Trigger:

Logic Level Range: 0.8 V low/2.2 V high

Trigger to A/D Latency: 10 µs max

Software Trigger:

Trigger to A/D Latency: Dependent on PC

Pre-Trigger: Up to 4 gig scans, depends on PC-card memory

Sequencer

Randomly programmable for channel and gain and for unipolar/bipolar (where applicable)

Depth: 1024 analog channels plus 128 digital channels

Channel to Channel Rate: 10 µs/channel, fixed

Maximum Rep Rate: 100 kHz

Minimum Rep Rate: 10 hours

Expansion Channel Sample Rate: Same as on-board channels, 10 µs/channel

General Purpose Digital I/O

24 I/O channels, expandable up to 192

Connector: DB37 male, P2

Device: 82C55

Maximum Input and Update Rate: 100 kHz

Output Voltage Levels:

Minimum “1" Voltage: 3.0 @ 2.5 mA sourcing

Maximum ”0" Voltage: 0.4 @ 2.5 mA sinking

Output Current:

Maximum Source Current: 2.5 mA

Maximum Sink Current: -2.5 mA

Input Voltage Levels:

Minimum Required “1" Voltage Level: 2.0 V

Maximum Allowed ”0" Voltage Level: 0.8 V

Output Float Leakage Current: 10 µA

High-Speed Digital I/O

Channels: 16 input lines

Connector: DB37 male, P3

Maximum Sampling Rate: 100K words/s

Input Low Voltage: 0.8 V max

Input High Voltage: 2.0 V min

Input Low Current: 10 µA

Input High Current: -10 µA

Frequency/Pulse Counter

Channels: 4, 16 bits per channel, cascadeable

Connector: DBK37 male, P3

Maximum Pulse Count: 32-bit binary (2 channels cascaded)

Maximum Input Rate: 1 MHz

Input Voltage: -15 to +15 V

Threshold Voltage (Low): 0.8 V typical, 0.5 V min

Threshold Voltage (High): 1.6 V typical, 2.1 V max

Hysteresis: 400 mV min

Pulse Width (High or Low): 520 ns min

Input Impedance: 27 KΩ pull-up to +5 V in parallel with 50 pF

Frequency/Pulse Generator

Channels: 2, 16 bits per channel

Connector: DB37 male, P3

Frequency/Pulse Generating Mode: Input frequency divided by
1 to 65,535

Input Low Voltage: 0.8 V max

Input High Voltage: 2.0 V min

Input Low Current: -10.0 µA max

Input High Current: 10.0 µA max

Output High Voltage: 2.4 V min @ -8 mA

Output Low Voltage: 0.5V max @ 8 mA

LogBook/300 Installation 2

Reference Notes:
You may find the following helpful with the installation:

- Chapter 1 for system block diagrams and operational overviews.
- Chapter 4 and the *DBK Basics* document module in regard to system expansion and calculating system power.
- Chapter 5 for information regarding LBK options.
- For specific DBK card information, refer to the *DBK Options Manual*, p/n 457-0905.

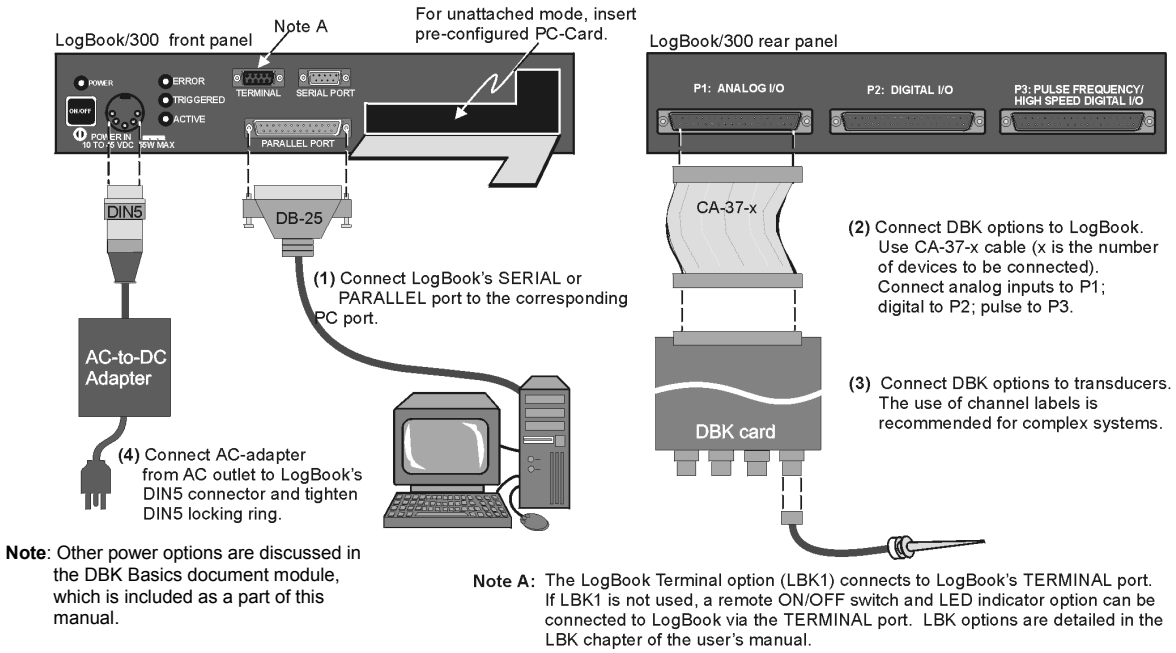
WARNING

Electric shock hazard. Turn off power to all system-connected devices prior to connecting or disconnecting cables, or setting hardware configurations. Failure to do so could result in electric shock or death, and equipment damage, even under low-voltage conditions.

When using LogBook/300 in *attached mode*, the PC-Card [in LogBook/300] must already have the file `logbook.sys`. Otherwise, LogView cannot communicate with LogBook/300, and LogBook/300 will appear dead.

Hardware Connection

The following hardware-connection figure and procedure are generic; details vary with system complexity.



LogBook/300 System, Basic Connections

Note: There are two styles of LogBook/300. The earlier version's PC-Card door is hinged on the right edge. The newer model, represented in the figure, is hinged on the lower edge.

After verifying that all equipment power is off, hardware connection typically proceeds as follows. Refer to the previous figure as needed.

1. Connect LogBook/300 to PC. There are three ways for LogBook/300 to communicate with the host PC. These are: parallel port, serial port, and manual transportation of the PC-Card. Note that the parallel port method is represented in the previous figure.

   a) **Parallel port** – If using the parallel port, connect the supplied 2-foot parallel port (DB25) cable to PARALLEL PORT on LogBook/300, and to the corresponding parallel port on the PC. When this method is used, the PC must be set to the ECP mode. See *ECP Parallel Port*, page 2-5 for additional information.

   b) **Serial port** – If using the serial port, connect the supplied 6-foot serial-port (DB9) cable to SERIAL PORT on LogBook/300, and to the corresponding serial port on the PC.

   c) **PC-Card** – With PC-Card communication, LogBook/300 does not require a connection to the computer, as communication is accomplished via the PC-Card. To provide the PC-Card with the correct configuration file, it must be configured from the PC, through LogView. After the PC-Card is configured, it is inserted into LogBook's PC-Card slot, located behind the front panel door.

Reference Notes:
Information pertaining to PC-Cards can be found in the *LogView* document module and in the following sub-sections of chapter 1.

- *What are LogBooks*, page 1-1.
- *The Use of PC-Cards with LogBook*, page 1-6.
- *Data Acquisition Overview*, page 1-9.
- *LogBook System File*, page 1-10.

2. Connect the LogBook/300 to the DBK cards and modules. Most of the analog DBKs connect to P1 on the rear panel; the digital DBKs generally connect to P2.

Reference Note:
For DBK card related information refer to the *DBK Options Manual*, p/n 457-0905. The document is included on your installation CD and is also available in hardcopy.

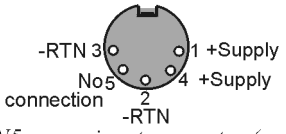
Note: The CA-37-x cable can daisy-chain several DBKs including the DBK41, which has a built-in P1 bus connection for 10 DBK cards. The *x* in the cable part number refers to the number of devices that can be connected to a device, for example: a CA-37-1 cable has two DB-37 connectors, one for connecting to the LogBook and another for connecting the card or module. Pinouts for P1, P2, and P3 are included in the *System Expansion* chapter.

CAUTION

For analog signal inputs via P1, do not exceed -35 VDC or +45 VDC. Exceeding these limits could result in equipment damage.

3. Connect DBK(s) to transducer(s). Follow instructions for the specific DBK(s) as described in the DBK Option Cards & Modules User's Manual, as well as instructions for the applicable transducers.

4. Connect the LogBook/300 to a suitable power source such as the included AC-to-DC adapter or the optional DBK34A. DC power sources such as a car batteries must supply 10 to 45 VDC and use the correct DIN5 pinout (see figure). A locking DIN5 connector assures a secure power connection for applications subject to vibration or thermal stress.



DIN5 power input connector (socket) as seen on LogBook's front panel

5. *Optional* - Just one cable connects between the LBK1 (via RJ-11 connector) and the LogBook/300 (via a DB9 connector). The standard cable is 6 ft long, and an optional cable is 25 ft long (see chapter 5 for LBK1 installation details).

Hardware Configuration

Reference Note:
Refer to the device-specific sections of the *LBK Options* chapter and to the *DBK Options Manual* (457-0905) for information regarding these devices. Note that certain DBK options require manual configuration.

LogBook/300's top cover does not need to be removed, except to add or remove an LBK option, or to replace the fuse.

Most LogBook/300 configuration is done via software as described in the *LogBook/300 Device Configuration* section of this chapter (page 2-4). Except when using the RS-485 communication option, LogBook/300 configuration does not require you to set jumpers or switches.

Software Installation

Note: The LogBook/300 is supported under Windows95/98/Me/XP/NT and 2000. Your computer should be a 486 or higher (Pentium® recommended) with at least 16 Mbytes of RAM. 32 Mbytes of RAM is recommended.

Note: Before installing software, ensure LogBook/300 is connected to the selected port (serial, or ECP-parallel); and that the system is powered-on.

To install software, place the installation CD in the PC's CD-drive and run **Setup.exe**; then follow the screen prompts.

When the software installation is complete, you will be given two options:

- *Exit running the configuration utility*. Choose this option if the LogBook/300 is to be used immediately.
- *Exit and return to operating system*. Choose this option if you are not going to use the LogBook right away. You can always run the configuration later from the control panel.

LogBook/300 Device Configuration

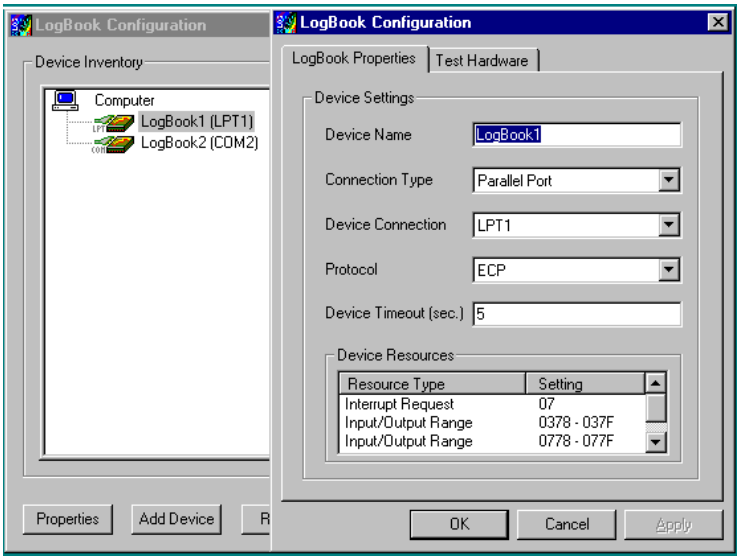
A configuration utility is supplied via a control panel applet. The **LogBook Configuration** applet allows you to add a device, remove a device, or change existing configuration settings. From this same window, you can also access a built-in utility to test the connected device for current setup and performance.

LogBook Configuration can be found in the Windows95/98/Me/XP and 2000 control panels. This can be navigated to from Window's desktop Start button:

Start ⇒ Settings ⇒ Control Panel

You can enter LogBook Configuration during driver installation or whenever you wish to add, remove or change device configuration settings.

The first configuration window will display configured devices in the Device Inventory field based on the port they're connected to. Devices are represented by an icon and text, e.g., LogBook (LPT1), as can be seen in the following figure. If no devices are configured, the device inventory field will remain blank. The figure shows the first and second configuration windows overlapped.



LogBook Configuration Windows

The four buttons across the bottom of the first configuration window (previous figure) are used as follows:

- **Properties**. Configuration settings for a device can be changed or modified from the corresponding properties window. To do so, double-click the device icon or single-click the device and then single-click the Properties button. The second configuration window will appear for the selected device as shown in the previous figure.
- **Add Device**. The Add Device button is used to add a device configuration whenever a new device is added to the system. LogView cannot recognize a device unless listed in the configuration window.
- **Remove**. The Remove button is used to remove a device from the configuration. A device may be removed if it is no longer installed or if the device's configuration no longer applies.
- **Close**. The Close button may be used at any time to exit the LogBook Configuration applet.

The second configuration window displays the properties for the selected LogBook/300. Fields include:

- **Device Name** is displayed with the default name, numbered successively as configured. This field can be changed to any descriptive name as desired.
- **Connection Type** can be serial or parallel port.
- **Device Connection** specifies the port name.
- **Protocol** is used to set the parallel port protocol (ECP only) or serial protocol (RS-232 or RS-485).
- **Device Timeout** specifies the number of seconds LogView will be wait for a LogBook response before displaying an error condition.

ECP Parallel Port

To use parallel port communication with an attached LogBook/300, your PC *must* support the ECP protocol AND be set in the ECP mode.

The majority of today's PCs support the Enhanced Computer Port protocol (ECP). If your computer does not support ECP, you can communicate with the LogBook/300 via the RS-232 serial port, or you can add an ECP-compatible ISA board or PC-Card parallel port. Setting the PC to ECP mode varies with different computers. On some computers, you can enter the BIOS Setup utility from Windows Settings or during startup by pressing the F1 function key. The Parallel Port Mode property can be found under the Peripheral Configuration group menu item. If necessary, consult your PC's documentation or your PC's manufacturer.

To ensure ECP compatibility after proper setup, use the Test Hardware utility (described on page 6). Before testing, make sure LogBook/300 is properly connected, powered on, and that the Parallel Port Mode is set to ECP (in BIOS Setup).

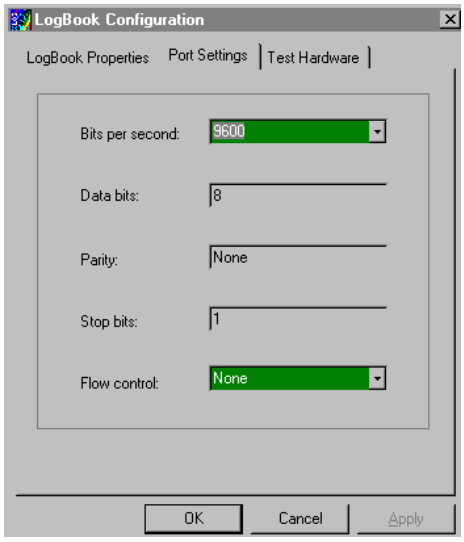
CAUTION

Making errors in BIOS Setup can disrupt your system's operation. If test hardware indicates a problem and you have inadequate experience with the BIOS Setup utility, consult your System Administrator or other qualified individual.

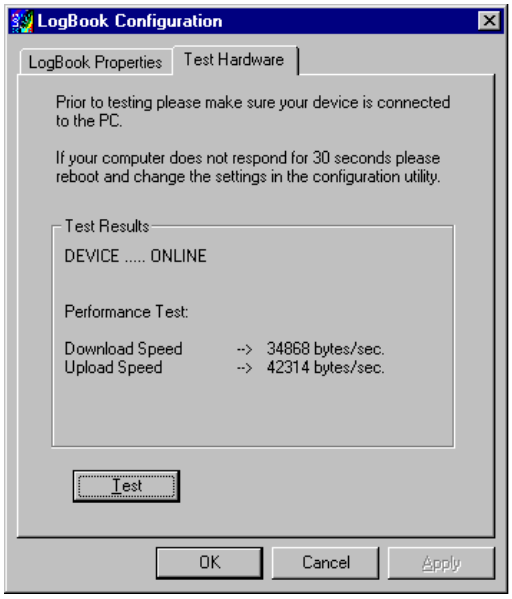
Serial Port

If the selected device is connected to a serial port the properties window will include the fields shown in the following figure. Baud rate can be set from 1200 to 115200 bits per second (default 9600). When all fields have been changed to the desired settings, you can click on one of the following options:

- **Apply** to store the device configuration. Parameters are not locked in until you click the Apply button. If you make changes and don't click Apply, clicking the Test button in Test Hardware will yield unexpected errors.
- **OK** to store the configuration and exit the current property screen.
- **Cancel** to exit the current screen without storing any changes.
- **Test Hardware** to test the current device.



LogBook Properties Tab



Test Hardware Tab

Testing Hardware

Before testing LogBook/300:

(a) Verify the device has been properly installed
(b) Make sure the communication cable (serial or parallel) is firmly in place to the proper ports.
(c) Verify the device is powered-on.

Testing the LogBook/300 device might cause the system to hang. If test results are not displayed within 30 seconds, or if the system does not respond properly: reboot the system. Upon power-up, re-enter the LogBook Configuration and ensure the configuration settings are correct. Change the settings as applicable.

To begin the test, click the Test button. Test results should be displayed within a few seconds.

Test results indicate if the device is online (properly connected, powered on and ready to transfer the data) or offline. If the device is online, Performance Test will display Download and Upload speed rates. These rates represent the maximum speed at which downloading and uploading files can be performed. Actual transfer time will depend on channel configuration and the size of the transfer.

Acquisition Configuration

An acquisition is configured using LogView on a PC and then stored as an acquisition setup file on a PC-Card. The PC-Card may be in an attached LogBook/300 or in the PC to be later manually transferred to an unattached LogBook/300. The system's DBK cards are listed; the scan sequence is defined; the trigger conditions are specified, etc.

Reference Note:
Configuring the acquisition is described in the *LogView* document module.

A Note about Calibration

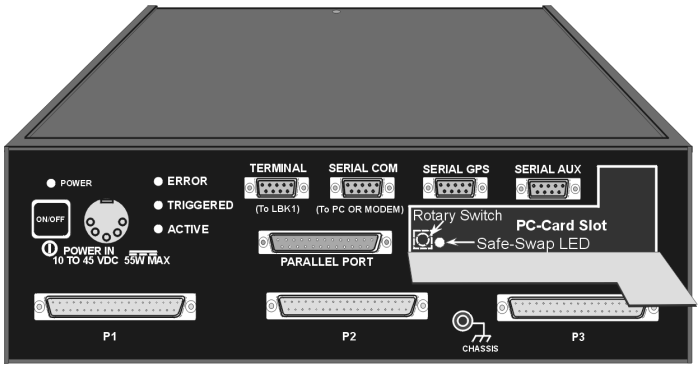
Calibration is typically performed automatically through LogView software; however, some DBKs may require manual calibration. LogView's 2-point calibration fine-tunes the reading's slope and offset error (*mx*+*b*). DBKs working with non-linear sensors typically condition/convert the reading to a linear form. Otherwise, a non-linear analog input signal is difficult to read accurately. Careful use of the calculated channels may yield usable approximations in simple, limited-range conditions.

Reference Notes:
An example of 2-point calibration is provided in the *Procedure* section of the *LogView* document module.

For information on calibrating the DBK16 and the DBK43A, refer to the calibration section at the end of the DBK16 and DBK43 document modules in the *DBK Options Manual* (p/n 457-0905).


Notes

LogBook/360 Installation 3



LogBook/360, Front Panel

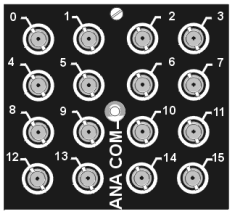
LogBook/360 combines the features and capabilities of LogBook/300 with a DBK60 expansion chassis. The *lower* portion of the **front panel** has three male DB37 connectors (P1, P2, and P3) for system expansion, and a post for connecting to CHASSIS ground. The *upper* section is nearly identical to LogBook/300.

Reference Notes:
You may need to refer to additional documentation:

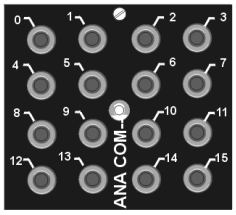
- Chapter 1 for system block diagrams and operational overviews.
- Chapter 4 and the *DBK Basics* document module in regard to system expansion and calculating system power.
- Chapter 5 for information regarding LBK options.
- For specific DBK card information, refer to the *DBK Options Manual*, p/n 457-0905.

The **rear panel** consists of three termination panels. Many different combinations of three panels are possible. Termination panels available at the time of publication are represented in the following figure.

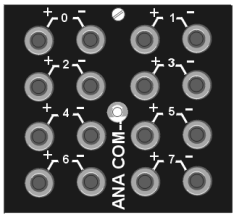
Blank Panel
DBK601



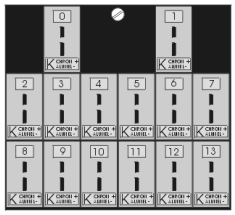
BNC Connectors
plus Analog Common
DBK602



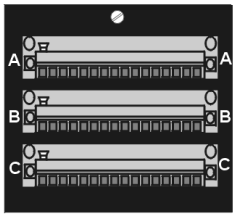
Safety Jacks, single-ended
plus Analog Common
DBK603



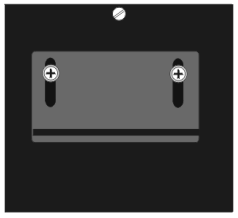
Safety Jacks, Differential
plus Analog Common
DBK604



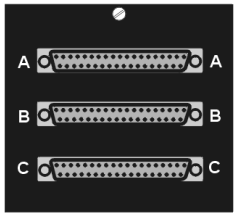
T/C Connectors, Differential
DBK605-B DBK605-R
DBK605-J DBK605-S
DBK605-K DBK605-T



Terminal Blocks,
16 connections per block
(48 connections per panel)
DBK606



Strain Relief Clamp
DBK607



DB37 Connectors, Female
DBK608

WARNING

Electric shock hazard. Turn off power to all system-connected devices prior to connecting or disconnecting cables, or setting hardware configurations. Failure to do so could result in electric shock or death, and equipment damage, even under low-voltage conditions.

CAUTION

Use ESD tools, containers, and procedures during setup of DBK cards. Electrostatic discharge can damage some components. To prevent pin damage, align DBK cards with the backplane DB37 connectors, then gently press them together.

When using LogBook in *attached mode*, the PC-Card [in LogBook] must already have the file `logbook.sys`. Otherwise, LogView cannot communicate with LogBook, and LogBook will appear dead.

Setting Up the Card Drawer

LogBook/360 can house three DBK cards internally, and make use of various termination panels. For user convenience, a card drawer can be slid free of the device. The following steps should be used when adding, removing, or changing cards. Refer to the following figure as needed.

1 – Turn off system power and disconnect LogBook/360.

Turn power off to the LogBook/360 and all connected devices. Disconnect LogBook/360 from the system.

2 – Remove top cover.

If you need to make any change on the LogBook motherboard, you will need to remove the top cover. Otherwise, the cover can remain in place. To remove the top cover, simply remove the two top cover screws and slide the cover free of the device.

3 – Remove card drawer.

A. Remove the two screws that hold the card drawer to the chassis.
B. Loosen the three termination panel thumbscrews.
C. Carefully pull the card drawer free of the chassis.

4 – Remove termination panels.

For each termination panel, remove the two screws that mount it to the card drawer, then remove the termination panel.

5 – Determine power requirements.

Depending on the power needs of your system's DBK cards, you may need to add a power card. Refer to the *DBK Basics* document module in regard to calculating your system's power requirement.

If the required power is more than the available power your system will require auxiliary power. One of two power supply cards can be used with LogBook/360:

- **DBK32A** – This DBK supplies ±15 V for use with a LogBook, DaqBook, or DaqBoard.
- **DBK33** – This DBK supplies +5 V and ±15 Vfor use with Log Book, DaqBook, DaqBoard, or Daq PC-Card.

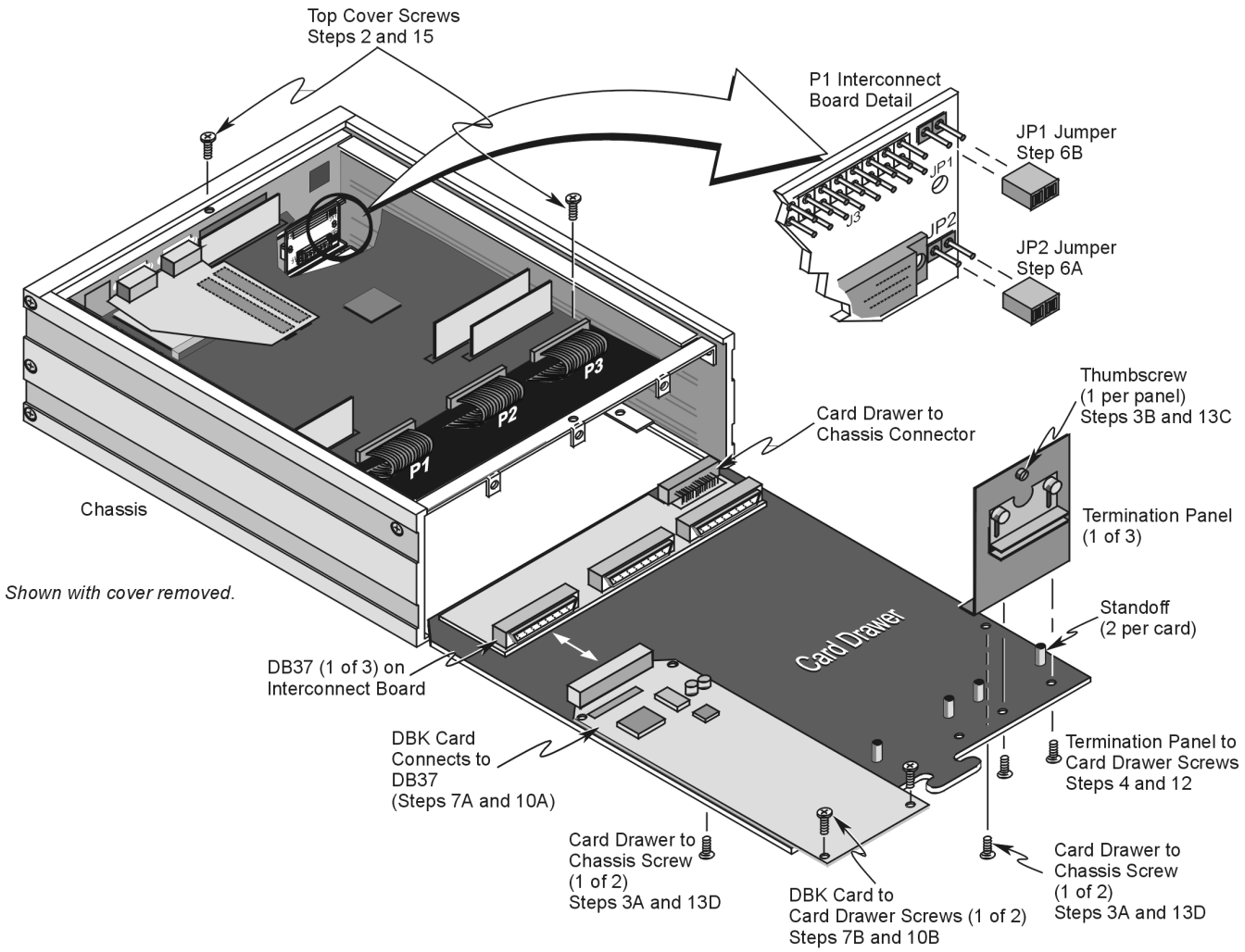
6 – Configure chassis for power sources.

Proper jumper configuration limits LogBook/360's P1 bus to one power source. The P1 bus should never have more than one power source.

The JP1 and JP2 jumpers *located on the P1 Interconnect Board inside chassis* (see previous figure) control the +5V distribution. Both the JP1 and JP2 jumpers are installed as factory-default.

A. **JP2**. ***Only remove the JP2 jumper if*** cards (on the internal P1 bus) are to be powered from LogBook/360's internal PCB.

B. **JP1**. ***Only remove the JP1 jumper if*** a DBK33 is used with the system.



LogBook/360, Hardware Setup

7 – Install power card if necessary.

If you determined in step 5 that additional power was needed, add a DBK32A or DBK33 power card to the chassis. The DBK Option Cards & Modules User's Manual includes detailed information regarding these power-related cards.

A. Carefully align the power card's DB37 connector with a DB37 connector on the interconnect board and gently press them together.
B. Mount the power card with two screws into the standoffs on the card drawer.

8 – Configure DBK cards.

Configure unique channel addresses with the jumpers on the DBK cards. Some cards have other jumpers and/or DIP switches. Refer to the specific DBK sections of the *DBK Options Manual* (p/n 457-0905) as needed.

9 – Install DBK cards.

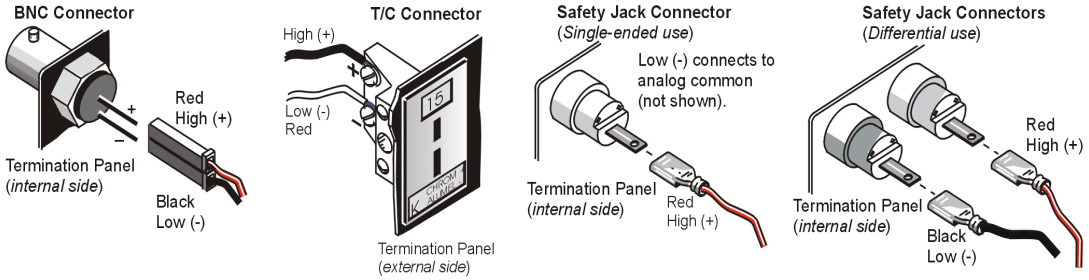
You must use **all analog** DBK cards in the LogBook/360; unless you have a factory modification that allows the use of **all digital** cards. You can not use both analog and digital cards at the same time.

A. Carefully align the DBK card's DB37 connector with a DB37 connector on the interconnect board and gently press them together (see figure).
B. Mount the DBK card with two screws into the standoffs on the card drawer (see previous figure).
C. Continue installation of any remaining DBK cards.

10 – Connect internal signals.

Connect signal inputs from DBK cards to termination panels. DBK cards connect to the termination panels in various ways (see figure and particular DBK sections in the DBK Option Cards and Modules User's Manual):

- Single-ended connections use analog common.
- Differential connections require the proper polarity, typically red-to-red for high (+) and black-to-black for low (-).
- For thermocouples, red is generally the low side. Always make sure the T/C connector and wire type match the T/C type used.



11 – Install termination panels.

Mount the termination panels to the card drawer with two screws for each panel.

12 – Install card drawer.

The card drawer slides into the bottom track of the chassis.

A. Hold the card drawer by its handle and tilt it up slightly. Place it on the bottom track of the chassis.
B. Carefully slide the card drawer into the chassis. When it engages the bottom track, level the card drawer and continue inserting it until it engages with the P1 interconnect board.
C. Tighten the three captive thumbscrews holding the termination panels to the chassis.
D. Install the two screws holding the card drawer to the chassis.

13 – Connect external signals.

Connect signal inputs from sensors to termination panels.

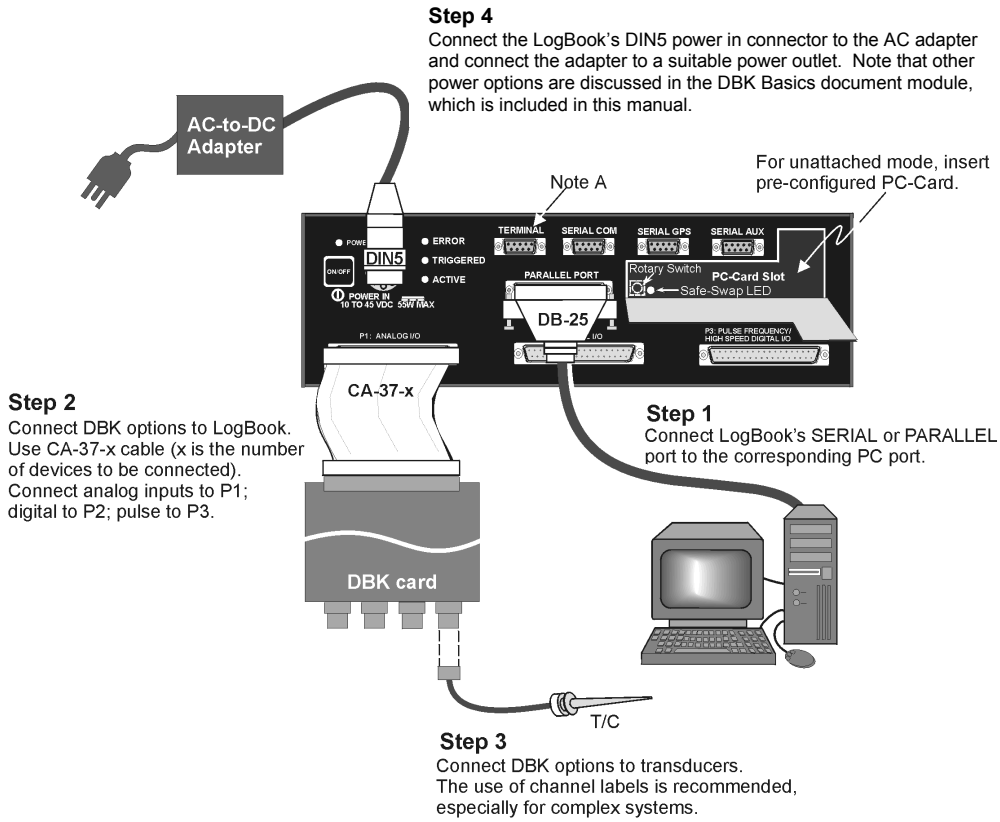
14 – Install top cover.

If the top cover was removed, slide it back into place and secure with two screws.

Connecting the LogBook/360 to the PC, External DBKs, and to Power

The following hardware-connection figure and procedure are generic; details vary with system complexity. For "unattached mode," a pre-configured PC-Card is inserted in the PC-Card slot, and no connection to a PC is made. The following figure illustrates the "attached" mode.

Note: Connecting LogBook/360 to a PC applies to the "attached mode" only. Many applications will make use of three internal DBK cards only, having no need to attach external DBK cards or modules as discussed in the following text.



Note A:
When used, the LogBook Terminal option (LBK1) connects to LogBook's TERMINAL port. If LBK1 is not used, a remote ON/OFF switch and LED indicator option can be connected to LogBook via the TERMINAL port. LBK options are detailed in the LBK chapter of the user's manual.

LogBook/360 System, "Attached Mode," Basic Connections

Note: Rear panel connections may be made via terminal blocks, as discussed in the previous section, *Card Drawer Setup*.

After verifying that all equipment power is off, hardware connection typically proceeds as follows. Refer to the above figure as needed.

1. Connect LogBook/360 to PC. There are three ways for LogBook/360 to communicate with the host PC. These are: parallel port, serial port, and PC-Card. Note that the parallel port method is represented in the previous figure.

   a) **Parallel port** – If using the parallel port, connect the supplied 2-foot parallel port (DB25) cable to PARALLEL PORT on LogBook/360, and to the corresponding parallel port on the PC. When this method is used, the PC must be set to the ECP mode. See the *ECP Parallel Port* section on page 3-8 for additional information.

   b) **Serial port** – If using the serial port, connect the supplied 6-foot serial-port (DB9) cable to SERIAL PORT on LogBook/360, and to the corresponding serial port on the PC.

   a) **PC-Card** - With PC-Card communication, LogBook/360 does not require a connection to the computer, as communication is accomplished via the PC-Card. To provide the PC-Card with the correct configuration file, it must be configured from the PC, through LogView. After the card is configured, it is inserted into LogBook's PC-Card slot, located behind the front panel door.

Reference Notes:
Information pertaining to PC-Cards can be found in the *LogView* document module and in the following sub-sections of chapter 1.

- *What are LogBooks*, page 1-1.
- *The Use of PC-Cards with LogBook*, page 1-6.
- *Data Acquisition Overview*, page 1-9.
- *LogBook System File*, page 1-10.

2. Connect LogBook/360 to the DBK cards and modules. For connecting internal DBK cards, refer to the earlier section entitled, *Setting Up the Card Drawer*.

   Most analog DBKs connect to P1; digital DBKs generally connect to P2. Refer to the *DBK Options Manual* (457-0905) in regard to your particular DBKs and for general DBK installation details.

   The CA-37-x cable can daisy-chain several DBKs including the DBK41, which has a built-in P1 bus connection for 10 DBK cards. The *x* in the cable part number refers to the number of devices that can be connected (a CA-37-1 actually has two DB-37 connectors).

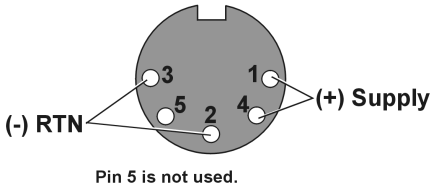
   Note: Chapter 4 includes LogBook/360 P1, P2, and P3 Pinouts.

CAUTION

For analog signal inputs via P1, do not exceed -35 VDC or +45 VDC. Exceeding these limits could result in equipment damage.

3. Connect DBK(s) to transducer(s). Follow instructions for particular DBK as described in the DBK Option Cards & Modules User's Manual and for the particular transducer. Some DBKs can accommodate both BNC and screw-terminal connections.

4. Connect LogBook/360 to a suitable power source, such as the included AC-to-DC adapter or optional DBK34A UPS / Battery Module. DC power sources such as a car batteries must supply 10 to 45 VDC and use the correct DIN5 pinout (see figure). A locking DIN5 connector assures a secure power connection for applications subject to vibration and thermal stress.



DIN5 Power Input Connector
(As seen on LogBook/360 Front Panel)

Hardware Configuration

Reference Notes:
Refer to the device-specific sections of the LBK options chapter and the *DBK Option Cards & Modules User's Manual* (457-0905) for information regarding these devices. Note that certain DBK options require manual configuration.

LogBook/360's top cover does not need to be removed, except to add or remove an LBK option, or to replace the fuse.

Most LogBook/360 configuration is done via software as described in section, *LogBook/360 Device Configuration*. Except when using the RS-485 communication option, LogBook/360 configuration does not require you to set jumpers or switches.

Software Installation

Note: The LogBook/360 is supported under Windows95/98/Me/XP/NT and 2000. Your computer should be a 486 or higher (Pentium® recommended) with at least 16 Mbytes of RAM. 32 Mbytes of RAM is recommended.

Note: Before installing software, you should attach LogBook/360 to the selected port (serial, or ECP-parallel); and power-on the system.

To install software, insert the installation CD into your PC's CD-drive, run the **Setup.exe** and follow the screen prompts.

When the software installation is complete, you will be given two options:

- Exit running the configuration utility—if the LogBook/360 is to be used immediately.
- Exit and return to operating system—you can run the configuration later from the control panel.

LogBook/360 Device Configuration

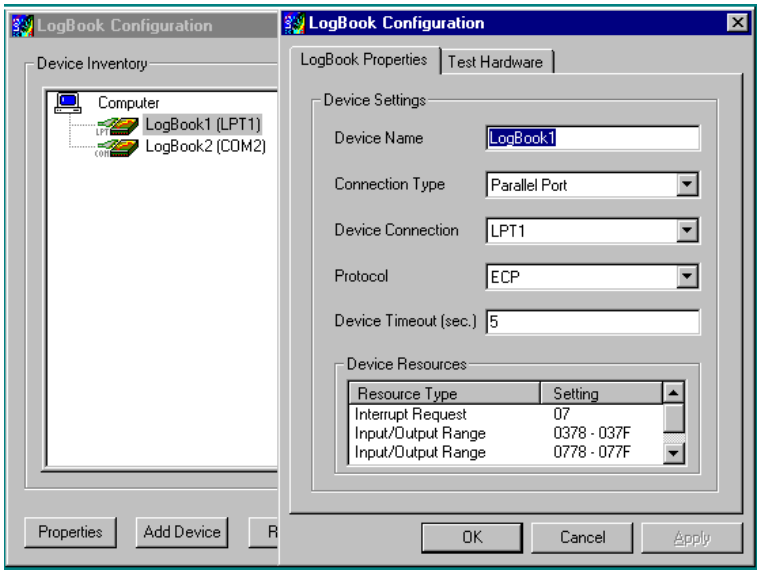
A configuration utility is supplied via a control panel applet. The **LogBook Configuration** applet allows you to add a device, remove a device, or change existing configuration settings. From this same window, you can also access a built-in utility to test the connected device for current setup and performance.

LogBook Configuration can be found in the Windows95/98/Me/XP/NT and 2000 control panels. The control panels can be navigated to from Window's desktop as follows:

Start ⇒ Settings ⇒ Control Panel

You can enter LogBook Configuration during driver installation or whenever you wish to add, remove or change device configuration settings. The following description applies to either method.

The first configuration window will display configured devices in the Device Inventory field based on the port they're connected to. Devices are represented by an icon, and text, e.g., LogBook (LPT1), as can be seen in the following figure. If no devices are configured, the device inventory field will remain blank. The figure shows the first and second configuration windows overlapped.



LogBook Configuration Windows

The four buttons across the bottom of the first configuration window (previous figure) are used as follows:

- **Properties**. Configuration settings for a device can be changed or modified from the corresponding properties window. To do so, double-click the device icon or single-click the device and then single-click the Properties button. The second configuration window will appear for the selected device as shown in the previous figure.
- **Add Device**. The Add Device button is used to add a device configuration whenever a new device is added to the system. LogView cannot recognize a device unless listed in the configuration window.
- **Remove**. The Remove button is used to remove a device from the configuration. A device may be removed if it is no longer installed or if the device's configuration no longer applies.
- **Close**. The Close button may be used at any time to exit the LogBook Configuration applet.

The second configuration window displays the properties for the selected LogBook. Fields include:

- **Device Name** is displayed with the default name, numbered successively as configured. This field can be changed to any descriptive name as desired.
- **Connection Type** can be serial or parallel port.
- **Device Connection** specifies the port name.
- **Protocol** is used to set the parallel port protocol (ECP only) or serial protocol (RS-232 or RS-485).
- **Device Timeout** specifies the number of seconds LogView will be wait for a LogBook response before displaying an error condition.

ECP Parallel Port

To use parallel port communication with an attached LogBook/360, your PC *must* support the ECP protocol AND be set in the ECP mode.

PCs made since 1994 probably support the Enhanced Computer Port protocol (ECP). If your parallel port does not support ECP, you can communicate with the LogBook/360 via the RS-232 serial port, or you can add an ECP-compatible ISA board or PC-Card parallel port. Setting the PC to ECP mode varies with different computers. On some computers, you can enter the BIOS Setup utility from Windows Settings or during startup by pressing the F1 function key. The Parallel Port Mode property can be found under the Peripheral Configuration group menu item. If necessary, consult your PC's documentation or your PC's manufacturer.

To ensure ECP compatibility after proper setup, use the Test Hardware utility (described on page 3-9). Before testing, make sure LogBook/360 is properly connected, powered on, and that the Parallel Port Mode is set to ECP (in BIOS Setup).

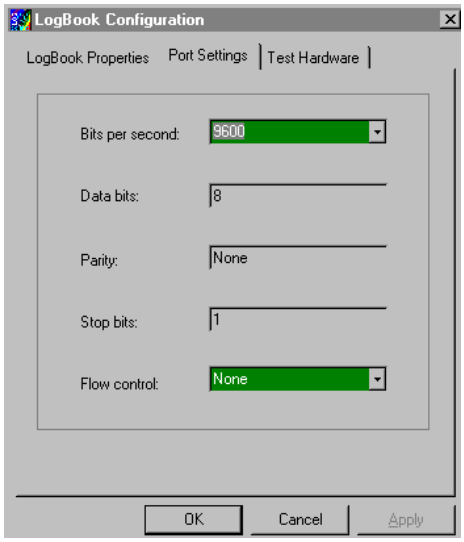
CAUTION

Making errors in BIOS Setup can disrupt your system's operation. If test hardware indicates a problem and you have inadequate experience with the BIOS Setup utility, consult your System Administrator or other qualified individual.

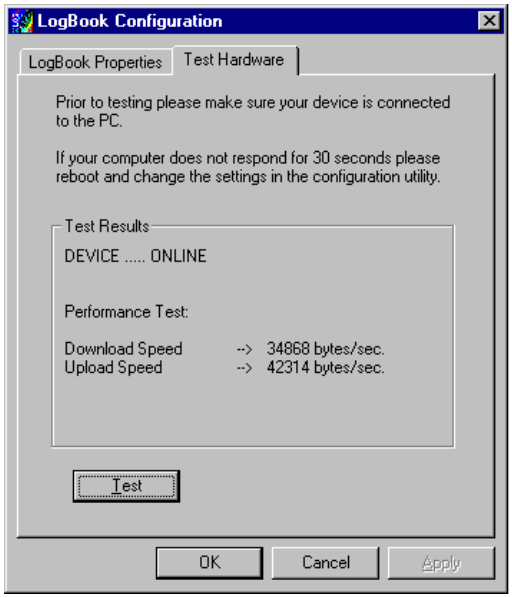
Serial Port

If the selected device is connected to a serial port the properties window will include the fields shown in the figure at right. Baud rate can be set from 1200 to 115200 bits per second (default 9600). When all fields have been changed to the desired settings, you can click on one of the following options:

- **Apply** to store the device configuration. Parameters are not locked in until you click the Apply button. If you make changes and don't click Apply, clicking the Test button in Test Hardware will yield unexpected errors.
- **OK** to store the configuration and exit the current property screen.
- **Cancel** to exit the current screen without storing any changes.
- **Test Hardware** to test the current device.



LogBook Properties Tab



Test Hardware Tab

Testing Hardware

Before testing LogBook/360:

a) Verify the device has been properly installed
b) Make sure the communication cable (serial or parallel) is firmly in place to the proper ports.
c) Verify the device is powered-on.

Testing the LogBook/360 device might cause the system to hang. If test results are not displayed within 30 seconds, or if the system does not respond properly: reboot the system. Upon power-up, re-enter the LogBook Configuration and ensure the LogBook configuration settings are correct. Change the settings as applicable.

To begin the test, click the Test button. Test results should be displayed within a few seconds.

Test results indicate if the device is online (properly connected, powered on and ready to transfer the data) or offline. If the device is online, Performance Test will display Download and Upload speed rates. These rates represent the maximum speed at which downloading and uploading files can be performed. Actual transfer time will depend on channel configuration and the size of the transfer.

Acquisition Configuration

An acquisition is configured using LogView on a PC and then stored as an acquisition setup file on a PC-Card. The PC-Card may be in an attached LogBook/360 or in the PC to be later manually transferred to an unattached LogBook/360. The system's DBK cards are listed; the scan sequence is defined; the trigger conditions are specified, etc.

Reference Note:
Configuring the acquisition is described in the *LogView* document module.

A Note about Calibration

Calibration is typically performed automatically through LogView software; however, some DBKs may require manual calibration. LogView's 2-point calibration fine-tunes the reading's slope and offset error ($mx+b$). DBKs working with non-linear sensors typically condition/convert the reading to a linear form. Otherwise, a non-linear analog input signal is difficult to read accurately. Careful use of the calculated channels may yield usable approximations in simple, limited-range conditions.

Reference Note:

An example of 2-point calibration is provided in the *Procedures* section of the *LogView* document module.

For information on calibrating the DBK16 and the DBK43A, refer to the calibration section at the end of the DBK16 and DBK43 document modules in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).


Notes

System Expansion 4

Reference Notes:

- **Power Supplies**, **Power Connectors**, and **Calculating Power Needs** are topics that are discussed in the document module, *DBK Basics*. The module immediately follows this chapter.
- The chapter entitled, *LBK and other non-DBK Options*, discusses several non-DBK related options that can be used with LogBook. These include, but are not limited to, COM/422/485, memory expansion, LBK1 remote terminal, global positioning system (GPS), use of a remote On/Off switch with an LED indicator.
- The *DBK Option Cards & Modules User's Manual* (p/n 457-0905), details optional DBK cards and modules and addresses DBK power issues. As a part of product support, the manual is automatically loaded onto your hard drive during software installation. The default location is the **Programs** directory, which can be accessed throught the Windows desktop.

Expansion and Enhancement Options

A variety of cards and modules can be used to expand and enhance LogBook systems. These options are found in three categories, LBK options, DBK options, and other. In addition to being discussed briefly below, LBK options are detailed in the following chapter, and DBK options are detailed in the DBK Option Cards & Modules User's Manual (p/n 457-0901). The "other" options are detailed in this chapter.

What are LBK Options?

LBK options are LogBook add-on features that can be used to enhance your system. The LBK options described briefly below, and are detailed in the following chapter.

LBK/COM/422/485, **RS-232 Board with an RS-422/485 Option**. The standard LogBook communications board supports RS-232 only. However, the LogBook can be purchased with the additional capability for RS-422 and RS-485. These optional boards (p/n LBK/COM/422/485) have circuitry for all three communication protocols.

LBKMEM1 or **LBKMEM1U**, **16 MB DRAM Memory Expansion**. The standard 4-MB RAM can be user-replaced with a 16 MB board (LBK/MEM1-U). The expanded memory creates a larger data buffer, allowing more time to swap PC-Cards. This is convenient when using fast scan rates. Note that the 16 MB memory option can also be installed at the factory (LBK/MEM1).

LBK1, **Remote Terminal with LCD Screen.** LBK1 provides a keypad to control the system's basic operation when no PC is attached and a LCD screen for viewing system status. A special rack (p/n Mount1) is available to attach the LBK1 to the top of LogBook. For applications in harsh environments, a special enclosure can be used to shield the unit from water and thermal stress.

LBK2, **4-channel Digital-to-Analog Output card**. The LBK2 Digital-to-Analog output board contains four 16-bit, voltage-output, digital-to-analog converters with a maximum update rate of 100 kHz per channel. The board is intended for waveform generation, UUT (Unit Under Test) stimulus, and signal feedback. Each converter has a fixed, full-scale output of ±10 VDC. The board's operation must be programmed through LogView.

What are DBK Options?

DBK option cards and modules exist for signal-conditioning, analog output, system I/O, auxiliary power, and expansion. Various sensor types are accommodated, including high-voltage/current, strain gages, thermocouples, isolation, relays, accelerometers, filtering, and simultaneous sample and hold.

Reference Notes:

- For a general introduction to DBKs, refer to the *DBK Basics* document module, included at the end of this chapter. The module discusses categories of DBK options, connectivity, tips on setting up a data acquisition system, and power considerations.
- DBK options are detailed in *DBK Option Cards & Modules User's Manual* (p/n 457-0905). As a part of product support, the manual is automatically loaded onto your hard drive during software installation. The default location is the **Programs** directory, which can be accessed throught the Windows desktop.

No matter what the signal input from the transducer, DBKs produce output signals suitable for analog-to-digital conversion (ADC). The output signals can be bipolar (typically -5 to +5 V) or unipolar (typically 0 to 10 V). The user can select a range of relevant values to correspond to the lowest and highest signal—this range selection guarantees the highest resolution in 16-bit conversion by the ADC.

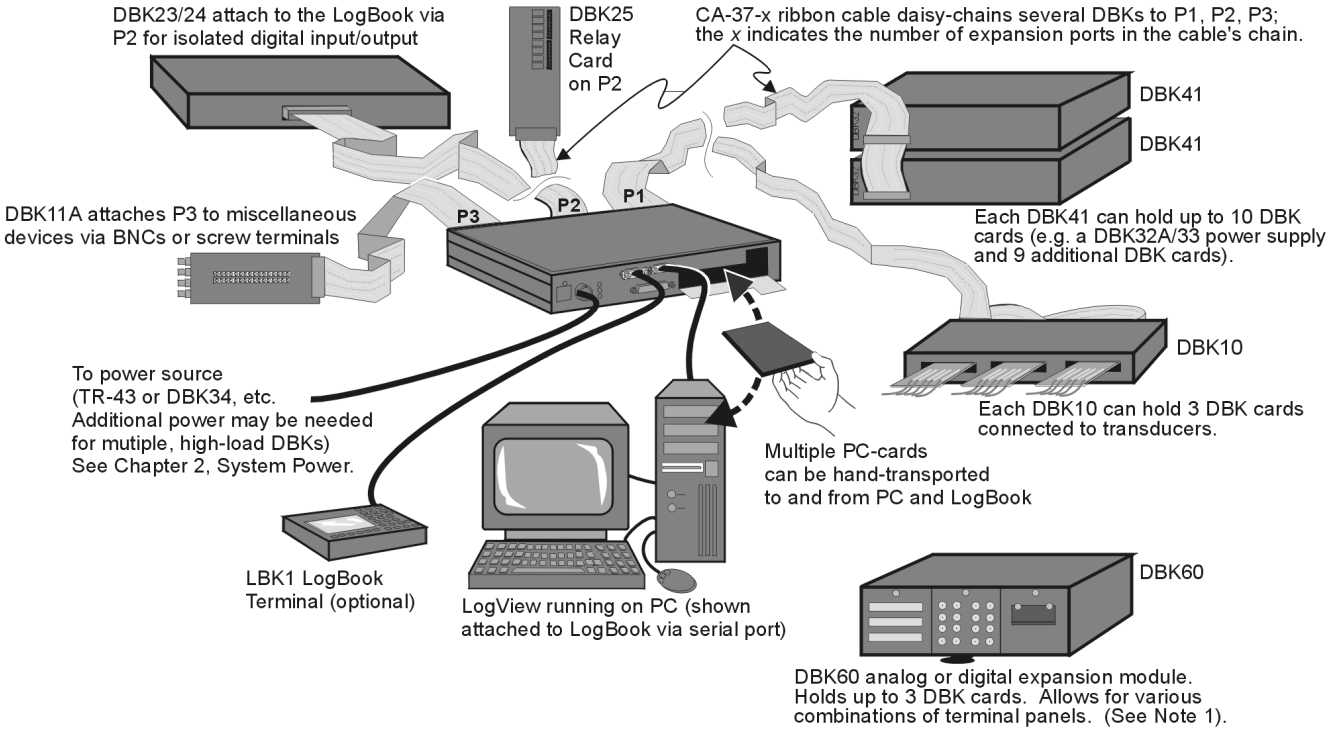
Note: DBKs vary in their outputs and gain settings. Refer to the specifications for the particular DBK used.

Basic Connection Concepts

Most system expansions stem from the 37-pin Signal I/O ports P1, P2, and P3. Note that LogBook/360 combines the features and capabilities of LogBook/300 with those of a DBK60 expansion chassis. In addition, LogBook/360 has a pre-installed serial communications card that provides GPS and AUX serial ports as detailed in the chapter entitled, *LBK and other non-DBK Options*.

- **P1**. Each of 16 main (base) channels can support up to 16 sub-channels and thereby provide expansion up to 256 analog input channels. LogBook's channel sequencer scans expansion channels at the same high speed as the base channels. DBKs can be daisy-chained off the P1 connector of LogBook or an expansion module. Some DBKs add another level of multiplexing and programmable gain to each channel, and setting channel parameters properly sometimes requires both hardware and software setup.
- **P2**. The Digital I/O port can accommodate the DBK20/21 (digital I/O cards), DBK23/24 (isolated digital input/output chassis), DBK25 (8-channel relay card), and other compatible devices; up to 208 digital I/O lines.
- **P3**. The Pulse Frequency port can be used for analog output and other uses. A DBK11A provides for easy signal connection via screw terminals or optional BNC connectors.

The following figure illustrates various expansion possibilities. Note that additional options exist. DBK options are detailed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).



A Few Possible Expansion Configurations

Note 1: LogBook/360 (not shown) combines the features and capabilities of LogBook/300 with those of a DBK60. In addition, LogBook/360 has two additional serial ports.

Power Options

Power options are covered in the *DBK Basics* document module, which immediately follows this chapter.

Other Options

Additional LogBook options, not belonging to the LBK or DBK categories, follow. They are detailed in the *LBK and Other Non-DBK Options* chapter.

LogBook/GPS, **Global Positioning System & Serial Device Data Collection Support,** *LogBook/360 Only*. This *software-enabled* option provides a means to collect serial data from various devices, convert it to channel values, and store it synchronously with the devices analog and digital inputs. Virtually any serial device that sources continuous ASCII data, including Global Positioning System (GPS) devices, gas flow meters, and scales, is compatible. GPS devices conforming to the NMEA 0183 standard are supported directly in the LogView interface, so no knowledge of the data format is necessary. **Note** that the GPS receiver must be purchased separately.

Note: The LogBook/GPS option is enabled from the *Authorization* dialog box, selected from LogView's File pull-down menu. Details are provided in the *LBK and Other Non-DBK Options* chapter.

LogBook/Modem, **Modem and Upload Scheduler Software Support**. With this *software-enabled* option, a modem-connected PC can communicate with LogBook virtually anywhere in the world. Any Hayes-compatible modem can be attached to the LogBook's serial port. Both standard desktop and wireless modems are supported. The Upload Scheduler is an independent application that allows the user to configure upload events on one or more LogBooks. To avoid waiting for a lengthy upload to complete, the Scheduler can be configured to perform the upload during unattended off-hours. For example, three upload events could be configured in the Scheduler, each for an upload of data at different hours. The Upload Scheduler can save valuable time by performing unattended uploads; especially in cases where modem-connected LogBooks are operating at slow baud rates.

Note: The LogBook/Modem option is enabled from the *Authorization* dialog box, selected from LogView's File pull-down menu. Details are provided in the *LBK and Other Non-DBK Options* chapter.

Remote On/Off Switch and LED Indicator Options. If LogBook's female DB9 TERMINAL connector is not being used for the LBK1 remote terminal or another device, it can be used to connect a remote on/off switch and/or indicator LED. The following chapter provides the information needed to add any one of the following three remote options:

- Remote On/Off Switch and LED
- Remote On/Off Switch (no LED)
- Remote LED Indicator (no remote switch)

Considerations

DBK Configuration

The DBKs are usually configured before the connections are made and power is applied. This order of installation can prevent equipment damage and help ensure proper operation on startup.

Many DBKs have on-board jumpers and/or DIP switches used for setting channels and other variables. These settings are discussed in the individual DBK sections of the *DBK Option Cards and Modules User's Manual* (p/n 457-0905), which is installed on the PC's hard drive as a part of product support. The default location is the Programs directory, accessible via the Windows Desktop.

For systems with many modules, stacking units together helps conserve space and assure easy cable runs. Such stacking is typically accomplished with the use of a splice kit. The kit is shipped as part of the package for several DBK modules. The splice plate kits include metal plates (fastener panels) that screw onto the sides of a module. A vertical rack of several modules can be assembled. An optional handle is available for portable use, for example, when using two stacked modules.
Prior to expanding your LogBook system you should review the following *DBK Basics* document module, with special attention to the section entitled, *Tips on Setting up a Data Acquisition System*. Prior planning will go a long way towards optimizing your acquisition setup and will most likely save you time.

Dimensional and Environmental Factors

Before setting up your LogBook-based acquisition system, you should consider the following size and environmental related factors.

LogBook/300 Dimensions: 8½ × 11 × 1-3/4 in. (216 × 279 × 44 mm). This enclosure has the same footprint as the DBK modules for easy stacking of units.

LogBook/360 Dimensions: 14 × 11 × 3-7/16 in. (330 × 279 × 84 mm). The width (11") provides for convenient stacking of DBK modules.

Operating temperature/humidity: -40° to 140°F (-40° to 60°C) @ 0 to 95% RH, non-condensing. Operation of the unit in environments exceeding these limits requires that a temperature-regulated enclosure).

Storage temperature: -40° to 176°F (-40° to 80°C). The standard case is rugged but not designed for immersion. Special enclosures are available for harsh environments.

All connectors, including the power connector, are locking. The D-sub connectors have thumbscrews and the DIN5 power connector has a twist-lock ring to ensure solid connections are maintained.

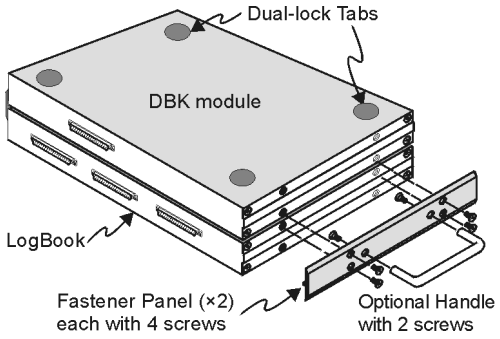
Mechanical Setup Options

DBK modules for packaging DBK expansion cards are available with three slots (DBK10, DBK60) or 10 slots (DBK41). The best option depends on the number of DBK cards in your system. For three or fewer cards, you can use the stackable 3-slot DBK10, or 3-slot DBK60.

Note: DBK60 has several termination-panel options, e.g., BNC, Safety-jack, T/C, removable block screw-terminal, slotted, and DB37-style.

For more than six cards, use the 10-slot DBK41. Several DBK41s can be daisy-chained to handle a large number of DBKs in a system. Another packaging option is the use of special enclosures for harsh environments. These enclosures can be locked to prevent tampering, conditioned for heat and/or cold, and sealed air- or water-tight. For systems with many modules, stacking units together helps conserve space and assure easy cable runs. Such stacking can be accomplished with adhesive dual-lock tabs or by the use of fastener-panels (splice plates). The splice-plate method provides for a more rigid stacking, and is the preferred method. Dual-lock tabs are convenient for mounting a Notebook PC to a LogBook or DBK module.

- **Dual-lock tabs**. Adhesive dual-lock tabs are typically used to attach a notebook PC to a LogBook or to a DBK module.
- **Fastener panels**. Optional splice plate kits can be used to provide rigid stacking. These kits include metal plates that form a vertical rack of two or more modules. This method allows the "enclosure" to size itself as needed. A handle can be attached for convenience.



P1, P2, and P3 Port Connectors

LogBooks have three port connectors: P1, P2, and P3. For **LogBook/300**, these connectors are located on the rear panel. For **LogBook/360**, they are on the front panel as discussed in the following note. Connector pinouts begin on the next page.

Note: LogBook/360 actually has two sets of P1, P2, and P3 connectors, one internal set located on the motherboard, and one external set located on the unit's front panel. LogBook/360's front panel P1, P2, and P3 connectors connect to the motherboard's P1, P2, and P3 via ribbon cables.

P1 (Analog Input)

LogBook's P1 connector is compatible with all DBK options. Features and capabilities of P1 signals include:

- High-performance signal connection for: ±10 V and 0-20 V input ranges, gains from ×1 to ×64 (each gain and range calibrated individually), and an input stage with low crosstalk, high dynamic impedance, small signal injection.
- All calibration is performed digitally; there are no pots to adjust.
- The sequencer depth (the number of channel readings in a scan) is 1024 analog channels and 128 digital channels.
- P1 includes an enhanced DBK-50 protocol that allows DBK cards or modules to identify themselves and carry their own calibration data. These same connections provide for complete configuration of DBK cards with that capability, while not requiring the use of jumpers.

CAUTION

For analog signal inputs via P1, do not exceed -35 VDC or +45 VDC or equipment damage may result.

P2 (Digital I/O)

P2 is used with various kinds of digital I/O. For autonomous operation without an attached PC, the P2 outputs may be preset before the acquisition. The P2 digital outputs may be used as alarm outputs to identify the detection of specified levels in the acquired data.

P3 (Pulse Frequency, High-Speed Digital I/O)

Features and capabilities of P3 signals include:

- Four 16-bit pulse counter channels, scannable along with analog inputs
- Additional digital I/O control lines for high-speed digital input and output.
- Four optional, internal, 16-bit ±10 V analog output channels (LBK2), useable for waveform or control output, or additional control lines for external analog output expansion.

The 16 high-speed digital I/O lines, along with the additional digital I/O control lines can now be used for real-time digital peripherals such as expanded digital input, or current or voltage DACs.

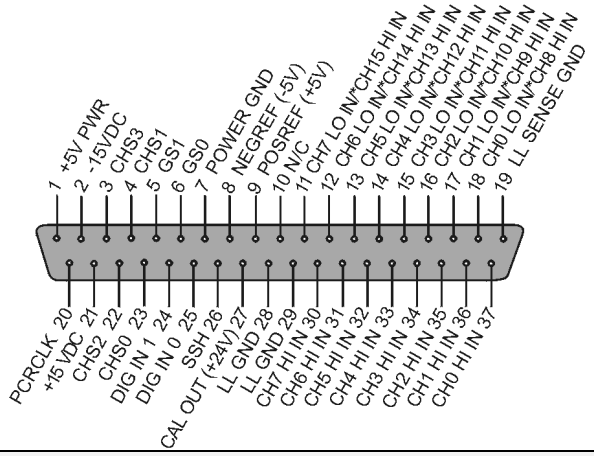
Optional, internal four-channel 16-bit waveform/control ±10 V DACs on P3:

- Initially setup to a static, preprogrammed voltage at the beginning of the acquisition.
- In the future, may be used for waveform or control outputs.

P1, P2, and P3 Pinout Tables

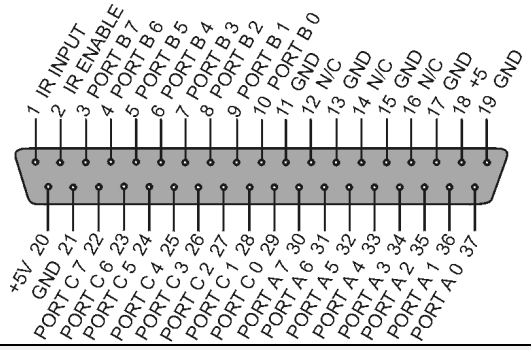
You can connect signals to LogBook's P1, P2, and P3 port connectors using a CA-37-x cable (via a D-shell 37-pin female connector), or a DBK11 screw-terminal card with component sockets. This page and the next two contain P1, P2, and P3 pinouts.

P1 – Analog I/O



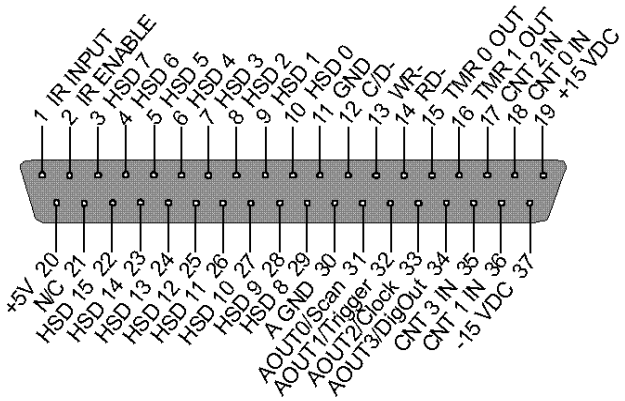
Pin	Signal Name	Description for P1 Pin Use
1	+5 PWR	+5 V supply @ 0.100 A
2	-15 VDC with diode	-15 V supply @ 0.150 A
3	CHS 3	Channel select line for expansion cards
4	CHS 1	Channel select line for expansion cards
5	GS 1	Gain select line for expansion cards
6	GS 0	Gain select line for expansion cards
7	POWER GND	Digital ground
8	NEGREF (-5 V)	-5.0000 VDC @ 0.005 A reference used for various DBKs
9	POSREF (+5 V)	+5.0000 VDC @ 0.005 A reference used for calibration with optional 4-channel D/A board
10	N/C	No Connection
11	CH 7 LO IN/CH 15 HI IN	Ch 7 LO IN (differential mode)/ch 15 HI IN (single-ended mode)
12	CH 6 LO IN/CH 14 HI IN	Ch 6 LO IN (differential mode)/ch 14 HI IN (single-ended mode)
13	CH 5 LO IN/CH 13 HI IN	Ch 5 LO IN (differential mode)/ch 13 HI IN (single-ended mode)
14	CH 4 LO IN/CH 12 HI IN	Ch 4 LO IN (differential mode)/ch 12 HI IN (single-ended mode)
15	CH 3 LO IN/CH 11 HI IN	Ch 3 LO IN (differential mode)/ch 11 HI IN (single-ended mode)
16	CH 2 LO IN/CH 10 HI IN	Ch 2 LO IN (differential mode)/ch 10 HI IN (single-ended mode)
17	CH 1 LO IN/CH 9 HI IN	Ch 1 LO IN (differential mode)/ch 9 HI IN(single-ended mode)
18	CH 0 LO IN/CH 8 HI IN	Ch 0 LO IN (differential mode)/ch 8 HI IN (single-ended mode)
19	L.L. GND	Low-level ground (analog ground - use with analog inputs and outputs)
20	PCRCLK	Pacer clock output/input
21	+15 VDC with diode	+15 V supply @ 0.150 A
22	CHS 2	Channel select line for expansion cards
23	CHS 0	Channel select line for expansion cards
24	DIG IN 1	Digital input bit 1
25	DIG IN 0	External TTL trigger input
26	SSH	Simultaneous Sample and Hold Output
27	CAL24	Calibration output (+24 V @ 0.010 A)
28	L.L. GND	Low-level ground (analog ground - use with analog inputs and outputs)
29	L.L. GND	Low-level ground (analog ground - use with analog inputs and outputs)
30	CH 7 HI IN	Ch 7 HI IN (single-ended mode or differential mode)
31	CH 6 HI IN	Ch 6 HI IN (single-ended mode or differential mode)
32	CH 5 HI IN	Ch 5 HI IN (single-ended mode or differential mode)
33	CH 4 HI IN	Ch 4 HI IN (single-ended mode or differential mode)
34	CH 3 HI IN	Ch 3 HI IN (single-ended mode or differential mode)
35	CH 2 HI IN	Ch 2 HI IN (single-ended mode or differential mode)
36	CH 1 HI IN	Ch 1 HI IN (single-ended mode or differential mode)
37	CH 0 HI IN	Ch 0 HI IN (single-ended mode or differential mode)

P2 Digital I/O



Pin	Signal Name	Description for P2 Pin Use
1	IR INPUT	Interrupt line input (no functions to access this)
2	IR ENABLE	Interrupt line enable (no functions to access this)
3	PORT B 7	Digital input/output – port B bit 7
4	PORT B 6	Digital input/output – port B bit 6
5	PORT B 5	Digital input/output – port B bit 5
6	PORT B 4	Digital input/output – port B bit 4
7	PORT B 3	Digital input/output – port B bit 3
8	PORT B 2	Digital input/output – port B bit 2
9	PORT B 1	Digital input/output – port B bit 1
10	PORT B 0	Digital input/output – port B bit 0
11	GND	Digital ground
12	N/C	Pin not connected/not used
13	GND	Digital ground
14	N/C	Pin not connected/not used
15	GND	Digital ground
16	N/C	Pin not connected/not used
17	GND	Digital ground
18	+5 V	+5 V supply @ 0.100 A
19	GND	Digital ground
20	+5 V	+5 V supply @ 0.100 A
21	GND	Digital ground
22	PORT C 7	Digital input/output – port C bit 7
23	PORT C 6	Digital input/output – port C bit 6
24	PORT C 5	Digital input/output – port C bit 5
25	PORT C 4	Digital input/output – port C bit 4
26	PORT C 3	Digital input/output – port C bit 3
27	PORT C 2	Digital input/output – port C bit 2
28	PORT C 1	Digital input/output – port C bit 1
29	PORT C 0	Digital input/output – port C bit 0
30	PORT A 7	Digital input/output – port A bit 7
31	PORT A 6	Digital input/output – port A bit 6
32	PORT A 5	Digital input/output – port A bit 5
33	PORT A 4	Digital input/output – port A bit 4
34	PORT A 3	Digital input/output – port A bit 3
35	PORT A 2	Digital input/output – port A bit 2
36	PORT A 1	Digital input/output – port A bit 1
37	PORT A 0	Digital input/output – port A bit 0
Note: No local lines are available if digital expansion cards are in use.		

P3 - Pulse Frequency/High-Speed Digital I/O



Pin	Signal Name	Description for P3 Pin Use
1	IR INPUT	Interrupt line input
2	IR ENABLE	Interrupt line enable
3	HSD 7	High-speed digital I/O bit 7 (low byte)
4	HSD 6	High-speed digital I/O bit 6 (low byte)
5	HSD 5	High-speed digital I/O bit 5 (low byte)
6	HSD 4	High-speed digital I/O bit 4 (low byte)
7	HSD 3	High-speed digital I/O bit 3 (low byte)
8	HSD 2	High-speed digital I/O bit 2 (low byte)
9	HSD 1	High-speed digital I/O bit 1 (low byte)
10	HSD 0	High-speed digital I/O bit 0 (low byte)
11	GND	Digital ground
12	C/D-	
13	WR-	
14	RD-	
15	TMR 0 OUT	Timer 0 output
16	TMR 1 OUT	Timer 1 output
17	CNT 2 IN	Counter 2 input
18	CNT 0 IN	Counter 0 input
19	+15 VDC	+15 V supply @ 0.050 A
20	+5 V	+5 V supply @ 0.100 A
21	N/C	Pin not connected/not used
22	HSD 15	High-speed digital I/O bit 15 (high byte)
23	HSD 14	High-speed digital I/O bit 14 (high byte)
24	HSD 13	High-speed digital I/O bit 13 (high byte)
25	HSD 12	High-speed digital I/O bit 12 (high byte)
26	HSD 11	High-speed digital I/O bit 11 (high byte)
27	HSD 10	High-speed digital I/O bit 10 (high byte)
28	HSD 9	High-speed digital I/O bit 9 (high byte)
29	HSD 8	High-speed digital I/O bit 8 (high byte)
30	AGND	Analog ground
31	AOUT0 / Scan	Analog output 0, optional LBK2: 16-bit, 100 kHz, ±10 VDC DAC
32	AOUT1 / Trigger	Analog output 1, optional LBK2: 16-bit, 100 kHz, ±10 VDC DAC
33	AOUT2 / Clock	Analog output 2, optional LBK2: 16-bit, 100 kHz, ±10 VDC DAC
34	AOUT3 / DigOut	Analog output 3, optional LBK2: 16-bit, 100 kHz, ±10 VDC DAC
35	CNT 3 IN	Counter 3 input
36	CNT 1 IN	Counter 1 input
37	-15 VDC	-15 V supply @ 0.050 A


Notes

DBK Basics

CAUTION

Turn off power to all devices connected to the system before connecting cables or setting configuration jumpers and switches. Electrical shock or damage to equipment can result even under low-voltage conditions.

CAUTION

The discharge of static electricity can damage some electronic components. Semiconductor devices are especially susceptible to ESD damage. You should always handle components carefully, and you should never touch connector pins or circuit components unless you are following ESD guidelines in an appropriate ESD controlled area. Such guidelines include the use of properly grounded mats and wrist straps, ESD bags and cartons, and related procedures.

Introduction

The term "DBK" typically refers to a card or module that is used to expand or enhance a primary data acquisition device, such as a DaqBook, DaqBoard, or LogBook. As will be seen in the upcoming DBK identification tables, DBKs provide a wide variety of data acquisition functions. Depending on the DBKs used, one or more of the following can be realized:

- signal conditioning
- analog output
- digital I/O
- channel expansion
- supplying powering to another acquisition device
- providing an interface for different connectivity; for example, in a DaqBoard/2000 Series board, converting a P4, 100-pin connector to P1, P2, and P3 37-pin, DB37 connectors.

Reference Notes: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation, especially the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) for details regarding both hardware and software in relevant to DBKs.

A copy of the Adobe Acrobat Reader® is included on your CD. The Acrobat Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

How Do DBKs Connect to the Data Acquisition Device?

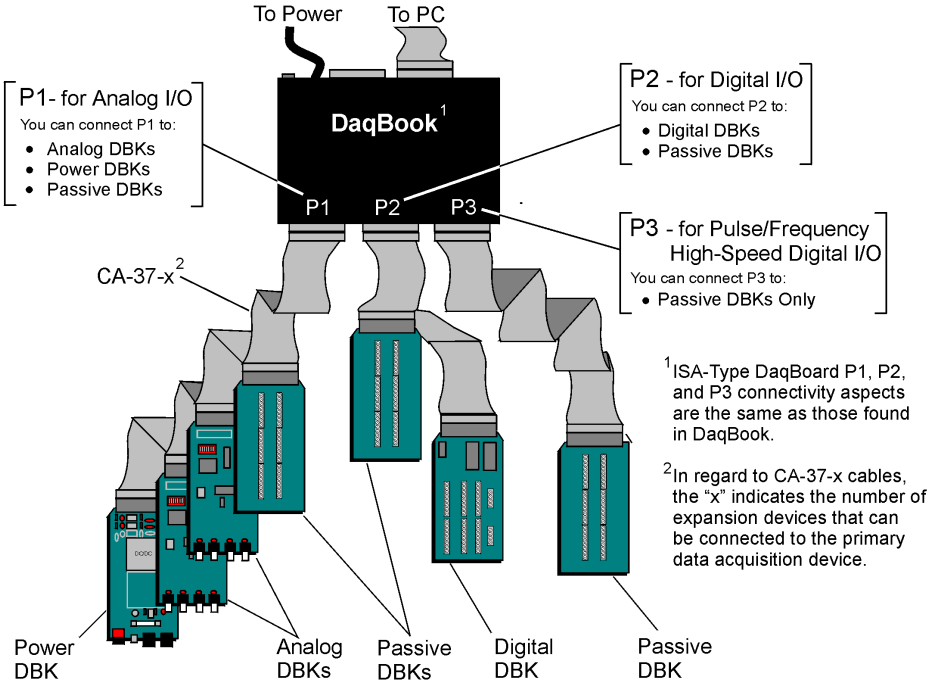
Each DBK connects to the primary data acquisition device; e.g., a DaqBook, DaqBoard, or LogBook, through one of three 37-pin ports, which are designated as follows:

- P1 – Analog I/O
- P2 – Digital I/O
- P3 – Pulse/Frequency/High-Speed Digital I/O

Depending on the primary data acquisition device, connectivity issues differ slightly. This will be made clear by the figures and accompanying text that follow.

Connecting DBKs to DaqBooks, ISA-Type DaqBoards, and LogBooks

For DaqBooks, ISA-Type DaqBoards, and LogBooks, DBK connections are not made directly to the port, but through a CA-37-x ribbon cable, where "x" indicates the number of expansion devices that can be connected. For example, in addition to providing a DB37 connector to interface with the primary data acquisition device, a CA-37-3 cable includes three additional DB37 connectors. These provide a means of adding three DBKs to one port. Use of a CA-37-16 cable will allow up to 16 DBKs to be added. The CA-37-x cable system is excellent for DaqBooks, LogBooks, and ISA-type DaqBoards.



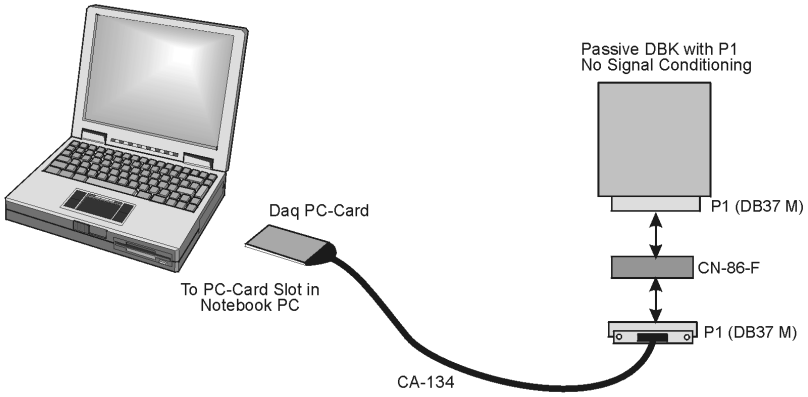
Connecting DBKs to a DaqBook

The above figure applies to LogBooks, DaqBooks, and ISA-type DaqBoards. As will be seen elsewhere in the documentation, some models do not include all three connectors (P1, P2, and P3).

Connecting DBKs to Daq PC-Cards

The Daq PC-Card is only intended for connections to a P1 connector of a single "passive" DBK card or module. A passive DBK card or module is one that provides a desired connectivity (such as BNCs or screw terminals), but performs no signal conditioning.

A CA-134 Interface Cable and a CN-86-F (dual DB37 female adapter) are used to provide the DB37, P1 connector.



Daq PC-Card Cabling

The CA-134 cable connects to a CN-86-F adapter, which then connects to a single "passive" card or module. The passive DBKs are:

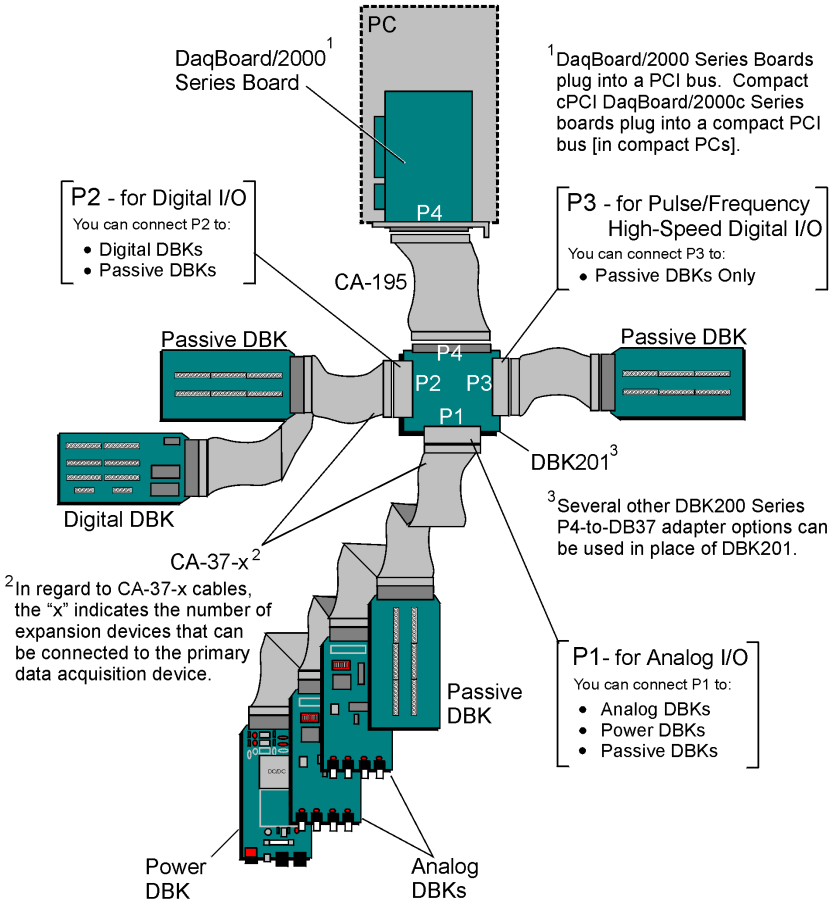
- **DBK1 – 16 Connector BNC Module**
- **DBK11A – Screw Terminal Option Card**
- **DBK40 – BNC Analog Interface**

Reference Note:
For information regarding the passive DBKs (DBK1, DBK11A, and DBK40), refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) for details regarding both hardware and software in relevant to DBKs.

Connecting DBKs to DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards

DaqBoard/2000 Series and cPCI DaqBoard/2000 Series boards have 100-pin connectors designated as P4. The 100 pins correlate to various pins on P1, P2, and P3 DB37 connectors.* Connectivity in the system is as follows (see figure).

- Both the DaqBoard/2000 and /2000c Series board connect to a CA-195 cable. The cable has two, 100-pin, P4 connectors.
- The CA-195 connects to a DBK200 Series adapter board or adapter module for 100-pin to 37-pin adaptations, e.g., P4-to-P1, P2, P3; but not necessarily all three.*
- The DBK200 Series adapter connects to a CA-37-x ribbon cable, where "x" indicates the number of expansion devices that can be connected. For example, in addition to providing a DB37 connector to interface with the primary data acquisition device, a CA-37-3 cable includes three additional DB37 connectors. These provide a means of adding three DBKs to one port. Use of a CA-37-16 cable will allow up to 16 DBKs to be added.
- The CA-37-x cable connects to expansion DBKs, in accordance with port type. For example, Analog DBKs to port P1, Digital DBKs to port 2, and passive DBKs to port 3.



Connecting DBKs to a DaqBoard/2000 Series Board

* DaqBoard/2003 and cPCI DaqBoard/2003c are exceptions to the above connectivity method. The /2003 board typically connects directly to a DBK205 (P4-to-Screw Terminal Adapter), as discussed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).

DBK Identification Tables

Analog Output DBKs

Analog Output			
Product	**Name/Description**	**I/O**	**Conectivity**
DBK2	Voltage Output Card	4 channels	P1
DBK5	Current Output Card	4 channels	P1

Digital I/O Control DBKs

Digital I/O / Control			
Product	**Name/Description**	**I/O**	**Conectivity**
DBK20	General-Purpose Digital I/O Card (Screw Terminals)	48 channels	P2
DBK21	General-Purpose Digital I/O Card (DB37 Connectors)	48 channels	P2
DBK23	Optically Isolated Digital-Input Module	24 channels	P2
DBK24	Optically Isolated Digital-Output Module	24 channels	P2
DBK25	Relay Output Card	8 channels	P2
DBK208	Carrier board for Opto-22 Compatible Solid-State-Relay Digital Modules.	Two 8-bit banks of SSR modules	Two P2s P4

Analog Signal Conditioning DBKs

The DBKs that are used for analog signal conditioning attach to transducers and condition their outputs into analog voltages. An A/D converter, located in the primary acquisition device, measures the analog voltages. There are many signal-conditioning solutions available (and more are in development). Note that DBK high-capacity modules require more circuitry than can fit on a compact card.

Analog Signal Conditioning			
Product	**Name/Description**	**I/O**	**Connectivity**[1]
DBK4	Dynamic Signal Input Card	2 channels	P1
DBK7	Frequency-to-Voltage Input Card	4 channels	P1
DBK8	High-Voltage Input Card	8 channels	P1
DBK9	RTD Measurement Card	8 channels	P1
DBK12	Low-Gain Analog Multiplexing Card Note 2	16 channels	P1
DBK13	High-Gain Analog Multiplexing Card Note 2	16 channels	P1
DBK15	Universal Current/Voltage Input Card Note 2	16 channels	P1
DBK16	Strain-Gage Measurement Card	2 channels	P1
DBK17	Simultaneous Sample & Hold Card	4 channels	P1
DBK18	Low-Pass Filter Card	4 channels	P1
DBK19	Thermocouple Card Note 2	14 channels	P1
DBK42	5B Isolated Signal-Conditioning Module	16 channels	P1
DBK43A	Strain-Gage Measurement Module	8 channels	P1
DBK44	5B Isolated Signal-Conditioning Card	2 channels	P1
DBK45	SSH and Low-Pass Filter Card	4 channels	P1
DBK50	Isolated High-Voltage Input Module	8 channels	P1
DBK51	Isolated Low-Voltage Input Module	8 channels	P1
DBK52	Thermocouple Input Module Note 2	14 channels	P1
DBK53	Low-Gain Analog Multiplexing Module Note 2	16 channels	P1
DBK54	High-Gain Analog Multiplexing Module Note 2	16 channels	P1
DBK70	Vehicle Network Interface, Analog Multiplexer Module	16 channels	P1
DBK80	Differential Voltage Input Card with Excitation Output	16 channels	P1
DBK81	Thermocouple Card, High-Accuracy	7 channels	P1
DBK82	Thermocouple Card, High-Accuracy	14 channels	P1
DBK83	Thermal Couple Card, High-Accuracy; uses Connection Pod	14 channels	POD-1
DBK84	Thermocouple Module, High-Accuracy	14 channels	P1
DBK207	Carrier Board for 5B Compatible Analog Input Modules	16 channels	Two P1s / P4
DBK207/CJC	Carrier Board for 5B Compatible Analog Input Modules. DBK207/CJC includes cold junction compensation (CJC)	16 channels	Two P1s / P4

Note 1: P1, P2, and P3 DB37 connectors do not exist on the DaqBoard/2000 Series or /2000c Series boards, but are obtained by using P4 adapters (DBK200 series). These adapters typically connect to the DaqBoard/2000 Series [/2000c Series] 100-pin P4 connector via a CA-195 cable.

Note 2: For DaqBoard/2000 and cPCI DaqBoard/2000 Series boards, internal clocks should be set to 100 kHz when used with any of the following DBK options: DBK12, DBK13, DBK15, DBK19, DBK52, DBK53, and DBK54. See specific DBK section for details.

Expansion and Terminal Panel Connection DBKs

The following DBKs offer provide various expansion and connection options. The stackable 3-slot DBK10 low-profile enclosure can be used for up to three DBKs. If a system has more than 3 DBKs, the 10-slot DBK41 can be used. Several DBK41s can be daisy-chained to accommodate many DBKs in one system.

Expansion and Connection, General			
Product	**Name/Description**	**I/O**	**Connectivity**
DBK1	16-Connector BNC Adapter Module	16 connectors	P1
DBK10	3-Slot Expansion Chassis	3 cards	P1, P2, or P3
DBK11A	Screw-Terminal Option Card (DB37-Screw Terminal Block)	Component sockets	P1
DBK40	BNC Interface	18 connectors	P1 or P3
DBK41	Analog Expansion Enclosure	10 cards	P1 or P2
DBK60	Expansion Chassis with Termination Panels	3 cards	P2

Termination Panels, Connectivity for DaqBoard/260			
Product	**Name/Description**	**I/O**	**Connectivity[1]**
DBK601	Termination Panel - blank rear panel	none	none
DBK602	Termination Panel - BNC rear panel	16 connectors	BNC
DBK603	Termination Panel - Safety Jacks, single ended	16 connectors	Safety Jacks
DBK604	Termination Panel - Safety Jacks, differential	8 differential (16)	Safety Jacks
DBK605	Termination Panels - Thermal Couple, differential panels; specify type: B, J, K, R, S, or T	16 differential	T/C Connectors
DBK606	Termination Panel – 3 Terminal Blocks; 16 connections per TB	48 connectors	Screw Terminal
DBK607	Termination Panel – strain relief clamp	none	none
DBK608	Termination Panel – 3 female DB37 connectors	three DB37	DB37

Several signal connection options were developed primarily for use with DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards. The DBK200 Series P4-Adapter documentation provides the basic connection concepts. That information, along with the related DBK subsections should enable you to set up your desired configuration.

P4 Adaptive Connection for DaqBoard/2000 Series and cPCI DaqBoard/2000c Series			
Product	**Name/Description**	**I/O**	**Connectivity[1]**
DBK200	P4-to-P1 Adapter Board	P1	P4
DBK201	P4-to-P1/P2/P3 Adapter Board	P1, P2, P3	P4
DBK202	P4-to-P1/P2/P3 Adapter Board with Screw-Terminals	P1, P2, P3	P4
DBK203	A module version of DBK202	P1, P2, P3	P4
DBK204	A module version of DBK202 with an included CE cable kit.	P1, P2, P3	P4
DBK205	P4-to-TB1 12-slot Screw Terminal Block for DaqBoard/2003.	TB1, 12-slot	P4
DBK206	P4-to-P1/P2/P3 Adapter Board with Screw-Terminals	P1, P2, P3	P4
DBK209	P4-to-P1/P2/P3 Mini-Adapter Board	P1, P2, P3	P4

Note 1: P1, P2, and P3 DB37 connectors do not exist on the DaqBoard/2000 Series, or /2000c Series boards, but are obtained by using P4 adapters (DBK200 series). These adapters typically connect to the DaqBoard/2000 Series [/2000c Series] 100-pin P4 connector via cable.

Power Supply DBKs

Power supply type DBKs are typically used in laboratory, automotive, and field applications. Input power can come from any +10 to +20 VDC source, or from an AC source by using an appropriately rated AC-to-DC adapter. The DBK30A rechargeable power supply can power DBK modules where AC mains are not available (the DBK30A outputs 28 V for powering transducers). For a large number of DBK cards, the DBK32A or DBK33 can be installed into an expansion slot. The DBK33 is used when +5 V is required in addition to ±15 VDC. The DBK34 provides a steady 12 or 24 VDC while working with vehicle electrical systems that may be turned on or off during testing.

Power Supply		
Product	**Name/Description**	**Power**
DBK30A	Rechargeable Battery/Excitation Module	+12-14, 24-28 VDC (3.4 A-hr @ 14 VDC)
DBK32A	Auxiliary Power Supply Card	±15 V @ 500 mA
DBK33	Triple-Output Power Supply Card	±15 V @ 250 mA; +5 V @ 1 A
DBK34	Vehicle UPS Module	12/24 VDC (5 A-hr @12 VDC)
DBK34A	UPS Battery Module	12/24 VDC (5 A-hr @12 VDC)

Tips on Setting up a Data Acquisition System

A successful installation involves setting up equipment and setting software parameters. In addition to this manual, you may need to consult your Daq device or LogBook user's manual.

DBKs should be configured before connections are made and power is applied. This sequence can prevent equipment damage and will help ensure proper operation on startup. Many DBKs have on-board jumpers and/or DIP switches that are used for setting channels and other variables. You will need to refer to the individual DBK document modules to ensure that the DBKs are properly configured for you application.

Prior to designing or setting up a custom data acquisition system, you should review the following tips. After reviewing the material you can write out the steps to setup a system that will best meet your specific application needs.

1. The end use of the acquisition data should be used to determine how you set up and program your acquisition system. Prior to creating the system you should understand its layout and know how you are going to assign the channels. If you can answer the following questions you are off to a good start. If not, you need to find the answers.

    - What engineering units, ranges, sampling rates, etc. are best for your data?
    - Will the data be charted graphically, statistically processed, or exported to other programs?
    - How will the data be used?
    - How will the data be saved?
    - What are your system' power requirements? Using several DBKs or transducers that require excitation current may require an extra power supply, e.g., a DBK32A.

2. Assign channel numbers.
3. Plan the location of transducers, cable runs, DBKs, the acquisition device [LogBook or Daq device], and the computer. Label your transducers, cables, and connectors to prevent later confusion.
4. When configuring your LogBook or Daq device(s) consider the following:

    - LogBook calibration is typically performed automatically through LogView software; however, some DBKs may require manual calibration.
    - **The DaqBook and DaqBoard (ISA type) have internal jumpers and switches that you must set manually to match your application.**
    - Some DaqBook models are partially configured in software.
    - Daq PC-Cards are configured entirely in software.
    - DaqBoard/2000 Series boards are PCI type boards. They have no jumpers or switches and are configured entirely through software.
    - cPCI DaqBoard/2000c Series boards are *compact* PCI (cPCI) type boards. They have no jumpers or switches and are configured entirely through software.
    - You may need to refer to other documentation, such as Quick Starts, Installation Guides, User's Manuals, and pertinent DBK document modules.

5. Perform all hardware configurations before connecting signal and power. Remember to configure all the DBK cards and modules for your application. Several jumpers and DIP switches may need to be set (channel, gain, filters, signal mode, etc).
6. Setting up channel parameters often requires both hardware and software setup.
7. Route and connect all signal and power cables while all power is turned OFF.
8. To minimize electrical noise, route all signal lines away from any RF or high-voltage devices.
9. Follow your device's specific installation instructions. For certain devices software should be installed first; for others, hardware should be installed prior to software installation.

10. **After software is loaded, remember to set the software parameters as needed for your application. The software must recognize all the hardware in the system. Measurement units and ranges should be checked to verify that they meet your application requirements.**
11. Remember to set all channels to the proper mode for your DBK or other signal source.
12. After your system is up and running, verify proper data acquisition and data storage.
13. Verify system accuracy; adjust ranges or calibrate as needed.
14. Device specific information regarding system setup and expansion can be found in the Daq and LogBook User's manuals; and in the applicable DBK document modules of this manual.
15. ***If you are considering system expansion***, review the DBK10, DBK41, and DBK60 document modules. The best option depends on the number of DBK cards in your system. For just a few cards, use the stackable 3-slot DBK10 low-profile expansion enclosure. For more than six cards, use the 10-slot DBK41. DBK41s can be daisy-chained to one-another to handle a large number of DBKs.
16. ***In regard to power management***, you should review the DBK30A, DBK32A, and DBK33 document modules. For portable applications, the compact DBK30A rechargeable power supply can provide power to the DBK10 or DBK41. The DBK30A also includes a 28 V output for powering 4 to 20 mA transducers. For applications with many DBK cards (initially or in future expansion), the DBK32A or DBK33 can be installed into any expansion slot. The DBK32A provides ±15 VDC and the DBK33 provides ±15 VDC *and* +5 VDC.

Power Supplies and Connectors

Power supplies convert the raw power they receive into a lower DC voltage and/or current for use by devices with various power demands. Many of the power supplies that are used to power data acquisition equipment are of the *switching-mode* type. These devices provide a regulated output whether the power supply's input is, for example, 60 Hz, 120 VAC as in the United States or, 50 Hz, 220 VAC as found in European countries. Small power supplies, that do not switch, consist of simple transformer/rectifiers and filtered capacitors; and operate over a smaller voltage range.

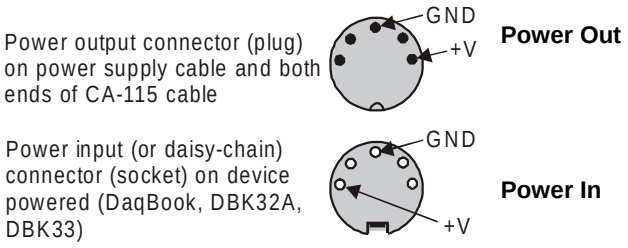
LogBooks - The switching-mode power supply commonly used with LogBook systems uses an input range of 100 VAC to 240 VAC at 50 Hz to 60 Hz. The power supply's output [to the LogBook] is 15 VDC @ 2.7 amps via a DIN5 connector.

DaqBooks - Power supplies that are used with DaqBooks are typically of the transformer/rectifier type. They supply the DaqBook with 15 VDC @ 900 mA via a DIN5 connector.

DBKs – The following table indicates the type of power supply that is typically used with certain DBKs.

15 VDC @ 2700 mA ***Switching-Mode* Type Power Supply** The DBKs in this column use up to 15 VDC @ 2700 mA. This *switching-mode* power supply receives power from a 100 to 240 VAC source, at 50 to 60 Hz, and converts it to the required value.		**15 VDC @ 900 mA** ***Transformer/Rectifier* Type, Unregulated Power Supply** The DBKs in this column use up to15 VDC @ 900 mA. This transformer/rectifier type power supply receives power from a 110 to 125 VAC source, at 60 Hz, and converts it to the required value.	
DBK	**Description**	**DBK**	**Description**
DBK32A	Auxiliary Power Supply Card	DBK23	Optically Isolated Digital-Input Module
DBK33	Triple-Output Power Supply Card	DBK24	Optically Isolated Digital-Output Module
DBK42	5B Isolated Signal Conditioning Module	DBK43A	Strain Gage Measurement Module
DBK70	Vehicle Network Interface	DBK50	Isolated High-Voltage Input Module
		DBK51	Isolated Low-Voltage Input Module

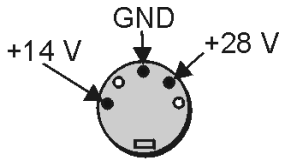
The DIN5 is the system's basic power connector (see the following figure). The CA-115 is a 6-in. cable with a plug (male) DIN5 connector on both ends. The CA-115 is used to connect DBK32As [or DBK33s] in parallel when they are to be powered by the same power supply.



DIN5 Power Connectors

Note: DIN5 connectors for LogBook, DBK34, and DBK34A have threaded retaining rings.

Note: The following figure shows the pinout for the DBK34 and DBK34A Power Out DIN5 connector. The 28 V pin is only active when the device is in the 28 VDC mode; however, the 14 V pin is active regardless of the mode selected.



DIN5 Power Out
On a DBK34 and DBK34A

An Introduction to Power-Related DBKs

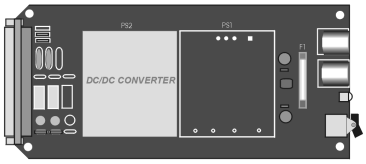
The power-related DBK options are the DBK30A, DBK32A, DBK33, DBK34, and DBK34A. From the standpoint of providing reliable power, these DBKs have proven convenient in laboratory, automotive, and field applications.

Input power for these devices can come from any 10 to 20 VDC source, or from an AC source via an appropriate AC-to-DC adapter.

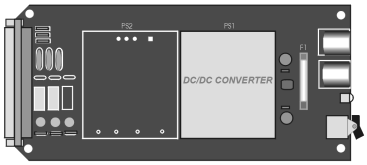
A brief synopsis of the DBK power options follows. Refer to the respective document modules for complete information.

DBK30A module - provides power at 14 and 28 VDC with a rated capacity of 3.4 A-hr @ 14 VDC. The DBK30A's 28 V output will power 4 to 20 mA transducers. The module's rechargeable power supply can power DBK modules in situations where AC mains are not available.

Note: Some transducers (e.g., 2-wire 4-20 mA transmitters, bridge-configured sensors, etc) require an excitation voltage in order to work properly. The DBK30A supplies 14 and 28 VDC. Consult transducer documentation before applying power.



DBK32A - provides ±15 VDC @ 500 mA.



DBK33 - provides ±15 VDC @ 250 mA *and* +5 VDC @ 1000 mA.

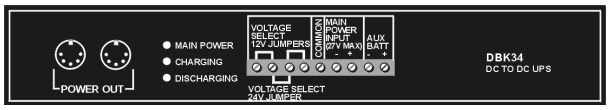
The DBK32A and DBK33 power cards attach directly to the P1 analog expansion bus where they supply power to DBK analog expansion cards. The DBK32A and the DBK33 can be powered from an included AC adapter, an optional DBK30A battery module, or from a +10 to +20 VDC source such as a car battery.

When installed in a DBK10 three-slot expansion chassis, the DBK32A or DBK33 supplies power to the analog DBK [that is to receive power] via a CA-37-x cable.

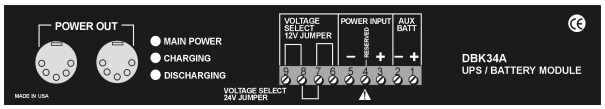
If used with the DBK41 ten-slot expansion enclosure, the DBK32A or DBK33 installs into one of the analog expansion slots on the DBK41's backplane. A power card in any DBK41slot (other than the leftmost, when viewed from the rear) will power the other cards that are connected to the DBK41's backplane.

CAUTION

If using a DBK32A or a DBK33 with a DaqBook or DaqBoard [ISA type], you must entirely remove the shunt jumpers from JP1. Failure to do so will result in damage to the 8254 timer chip. Refer to the power card document modules and to the *Daq device Hardware* sections of the DaqBook ans DaqBoard [ISA] user's manuals for JP1 location and configuration.



DBK34 module – provides 12 or 24 VDC with a 5.0 or 2.5 A-hr capacity (respectively). This module is an Uninterruptable Power Supply (UPS) that can be used for in-vehicle testing where the vehicle's electrical system will not affect acquisition device power during starter-current surge, or power-off.



DBK34A module – provides 12 or 24 VDC with a 5.0 or 2.5 A-hr capacity (respectively). This device is classified as a UPS / Battery module. It is an improved version of the earlier DBK34. Like the DBK34, the DBK34A can be used for in-vehicle testing where the vehicle's electrical system will not affect acquisition device power during power during starter-current surge, or power-off.

Calculating Your System's Power Needs

Use the chart below and the worktable on the next page to ensure your system will have sufficient power. If the load (calculated in the worktable) exceeds available power (from the chart at the right), you must add a power card or a module such as a DBK32A or DBK33.

Available Power Chart—Supply	
Product	**Available Power**
LogBook	+5 VDC @ 0.10 A from P1-1, P2-18, P2-20, P3-20 +15 VDC @ 0.15 A from P1-21 +15 VDC @ 0.05 A from P3-19 -15 VDC @ 0.15 A from P1-2 -15 VDC @ 0.05 A from P3-37
DaqBook/100	2100 mW
DaqBook/112	2400 mW
DaqBook/120	2100 mW
DaqBook/200	4000 mW
DaqBook/216	4000 mW
DaqBook/260	4000 mW
DaqBoard/100A	3300 mW
DaqBoard/112A	3300 mW
DaqBoard/200A	3000 mW
DaqBoard/216A	3000 mW
DaqBoard/260A	3000 mW
DaqBoard/2000 Series & /2000c Series	5000 mW; 5 V at 1 A; ±15 V at 75 mA each (with exception of DaqBoard/2002 and /2002c)
Daq PC-Card/112B	0 mW
Daq PC-Card/216B	0 mW
DBK32	7500 mW
DBK32A	15000 mW
DBK33	7500 mW
DBK34	5 A-hr in 12 V mode; fused at 8 A
DBK34A	5 A-hr in 12 V mode; fused at 8 A

Use the following procedure and table to calculate the required system power.

1. In the Quantity column (5th), list the number of DBKs of that type in your system.
2. In the Sub Total column (7th), enter the product of column 5 and column 6 (mW).
3. Add the Sub Total column, and enter the sum at the bottom right of the table. This result is your power requirement in mW.

DBK32, DBK32A, and DBK34 cannot supply +5 VDC.
In cases that require +5 VDC, if the +5 VDC requirement exceeds 500 mW from a LogBook or Daq device, then a DBK33 must be used. Note that DBK33 can supply 1000 mW at +5 VDC.

Note: The DBK34 has an 8 amp fuse, and has a capacity of 5 A-hr when in the 12V mode, and a capacity of 2.5 A-hr when in the 24V mode.

DBK Power Requirement Worktable—Demand						
DBK	**Voltage Reference**			**Calculation**		
Options	**+15 VDC**	**-15 VDC**	**+5 VDC**	**Quantity**	**× mW**	**= Sub Total**
DBK1	0	0	0		0	
DBK2	18 mA	18 mA	5 mA		565	
DBK4	95 mA	80 mA	25 mA		2750	
DBK5	2 mA	2 mA	15 mA		135	
DBK7	14 mA	8 mA	18 mA		420	
DBK8	15 mA	15 mA	<1 mA		455	
DBK9	21 mA	16 mA	<1 mA		560	
DBK11A	0	0	0		0	
DBK12	15 mA	15 mA	<1 mA		455	
DBK13	15 mA	15 mA	<1 mA		455	
DBK15	16 mA	16 mA	<1 mA		485	
DBK16	37 mA	32 mA	<1 mA		1040	
DBK17	30 mA	30 mA	<1 mA		905	
DBK18	36 mA	36 mA	<1 mA		1085	
DBK19	6 mA	7 mA	<1 mA		200	
DBK20	0	0	<10 mA		50	
DBK21	0	0	<10 mA		50	
DBK23* **	0	0	<2 mA		10	
DBK24* **	0	0	<2 mA		10	
DBK25	0	0	<2 mA		10	
DBK40	0	0	0		0	
DBK41	0	0	0		0	
DBK42	<1 mA	<1 mA	<1 mA		35	
DBK43A* **	<1 mA	<1 mA	<1 mA		35	
DBK44	<1 mA	<1 mA	60 mA (Note 1)		330	
DBK45	52 mA	52 mA	<1 mA		1565	
DBK50* **	<1 mA	<1 mA	<1 mA		35	
DBK51* **	<1 mA	<1 mA	<1 mA		35	
DBK52	6 mA	7 mA	<1 mA		200	
DBK53	15 mA	15 mA	<1 mA		455	
DBK54	15 mA	15 mA	<1 mA		455	
DBK70* **	<1 mA	<1 mA	<1 mA		35	
DBK80	25 mA	25 mA	<1 mA		755	
DBK81	35 mA	35 mA	<2 mA		1060	
DBK82	60 mA	60 mA	<2 mA		1810	
DBK83	60 mA	60 mA	<2 mA		1810	
DBK84	60 mA	60 mA	<2 mA		1810	
				Total Power Requirement in mW		

Note 1: DBK44's 60 mA value is based on 30 mA for each of two 5B modules. This value will be higher if using 5B module 5B38 (200 mA for each 5B38), or if using 5B39 (170 mA for each 5B39). Refer to the DBK44 document module for more information.

Note 2: DBK2 and DBK5 are not used with LogBook.

*** Three asterisks indicate that the DBK is a module with internal power supply; powered separately.

Additional Reading

During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

You should refer to the following documents, as applicable, for acquisition system and programming information.

- *DBK Option Cards and Modules User's Manual* (p/n 457-0905)
- *DBK70 User's Manual* (p/n 1056-0901)
- *DaqBoard [ISA] User's Manual* (p/n 457-0906)
- *DaqBook User's Manual* (p/n 457-0907)
- *Daq PC-Card User's Manual* (p/n 457-0908)
- *DaqBoard/2000 Series and cPCI DaqBoard/2000c Series User's Manual* (p/n 1033-0901)
- *LogBook User's Manual* (p/n 461-0901)
- *Programmer's Manual* (p/n 1008-0901)
- *Post Acquisition Data Analysis User's Guide(s)*

Of the above listed documents, the most relevant to the DBKs is the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). A synopsis of the contents follows:

1 – ***Introduction to DBKs***. Explains what DBKs are and uses tables to identify the various types of DBKs. The chapter includes tips for setting up a data acquisition system, discussions of signal management and signal conditioning, and CE compliance information.

2 – ***Power Management***. Explains how to determine system power requirements and discusses various power options.

3 – ***System Connections and Pinouts***. Provides instructions for connecting a DBK option to a Daq or LogBook device. Pinouts are included for the P1, P2, and P3 DB37 connectors, as well as the 100-pin P4 connector used by PCI and compact PCI (cPCI) boards.

4 – ***DBK Set Up in DaqView***. Provides instruction for setting up analog and digital DBKs in *DaqView's Hardware Configuration* screen.

5 – ***DBK Set Up in LogView***. Provides instruction for setting up analog and digital DBKs in *LogView's Hardware Configuration* window.

6 – ***Troubleshooting***. Explains solutions to common noise, wiring, and configuration problems.

DBK Document Modules –Includes DBK-specific documentation for the card and module options listed on pages 5 and 6 of this document.

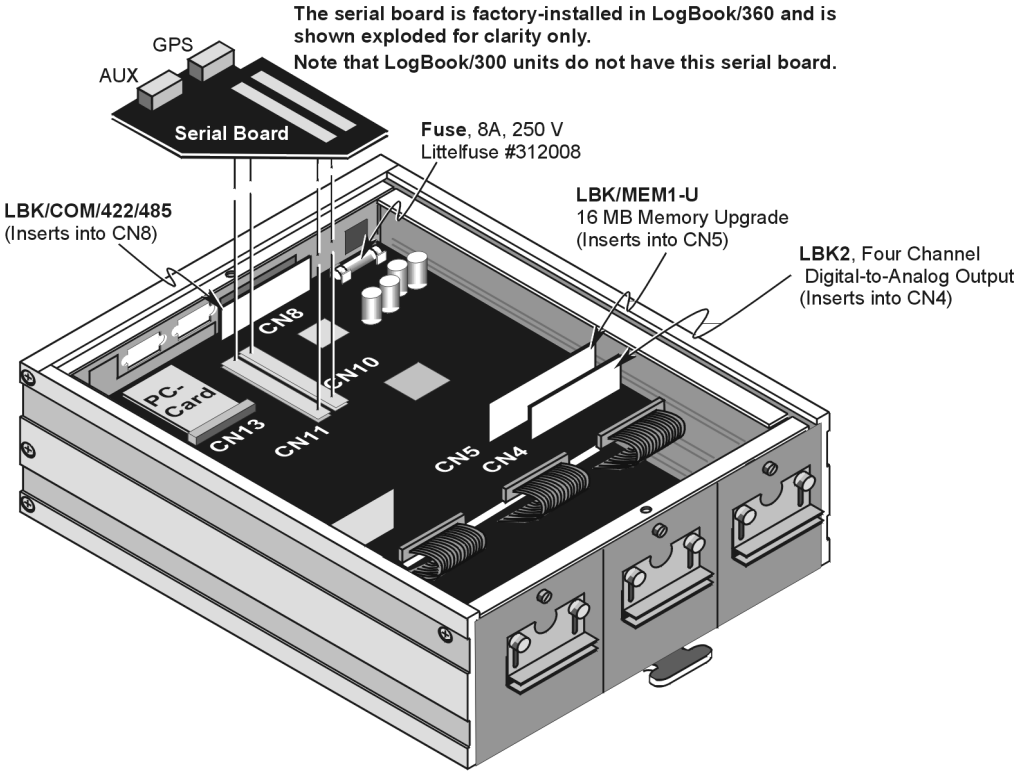

Notes

LBK and other non-DBK Options 5

LBK Options, Location Reference

The following location reference applies to hardware aspects of LogBook's LBK options. Other non-DBK related options, e.g., LogBook/GPS and LogBook/Modem are software-enabled options and do not appear in the illustration. A fuse, serial board, and PC-Card are included in the illustration for component reference.

Although the following drawing is based on LogBook/360, it can be used for LogBook/300 motherboard reference. The remainder of this chapter discusses the installation of each option, and includes a board layout.



Component Location Reference

Notes: (1) Information regarding LBK1 (the remote LogBook Terminal) begins on page 4-7.
(2) The actual LogBook motherboard, depicted above for LogBook/360, also applies to LogBook/300.
(3) The AUX/GPS Serial Board is *factory-installed* in LogBook/360.
(4) The AUX/GPS Serial Board is not used in LogBook/300.


Notes

LBK/COM/422/485

The standard LogBook communications board supports RS-232 only; but as an option, the LogBook can be purchased with the additional capability for RS-422 and RS-485. These optional boards (p/n LBK/COM/422/485) have circuitry for all three communication protocols on the same board. If your communication board has the RS-422/485 option, you can switch between RS-232 and RS-422/485 by switching the board's orientation in the CN8 slot.

SERIAL COM pinouts for RS-232 and RS-422 / RS-485 are included on the following page.

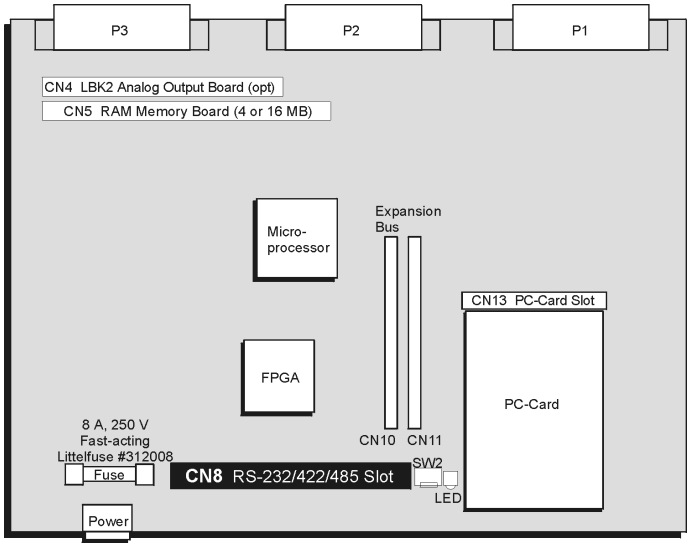
WARNING

Electric shock hazard. Turn off power to all system-connected devices prior to connecting or disconnecting cables, or setting hardware configurations. Failure to do so could result in electric shock or death, and equipment damage, even under low-voltage conditions.

CAUTION

Perform the following procedure using ESD tools, containers, and procedures. One or more related components are sensitive to damage from electrostatic discharge.

1. Turn off system power.
2. Remove the LogBook's top cover and locate CN8 (see figure for location).
3. Remove the RS-232/485 board from CN8. Note that CN8 has two release clips.
4. Rotate the RS-232/485 board to a relatively upside-down position, and insert back into CN8. Note that onboard text indicates which end should be up for a given communication (RS-232 ↑ UP ↑, or RS-485 ↑ UP ↑).
5. For RS-485 applications, ensure the address setting on rotary switch SW2 is unassigned; and change the address if needed. See note.
6. Replace the top cover and screws.
7. Turn on system power.



LogBook Motherboard, CN8 Location Reference

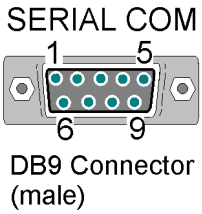
Notes:

(1) The CN8 slot has two release clips that must be depressed to release the COM card.

(2) The COM Card has onboard text, indicating orientation, as follows:
"RS-232 ↑ UP ↑"
"RS-485 ↑ UP ↑"

The LBK/COM/422/485 Card inserts into the CN8 slot on LogBook's Motherboard.

For RS-485 applications, rotary switch SW2 sets the address. SW2 is located next to CN8, just inside the PC-Card door. Use a small flat-head screwdriver to set a particular address (1 of 16) in a multi-drop RS-485 network. Rotate the switch so the black dot aligns with the desired, *previously unassigned*, address.

RS-232 Mode			RS-422 / RS-485 Mode	
Pin	**Description**		**Pin**	**Description**
1	Not Used		1	Common
2	RxD		2	Not Used
3	TxD		3	Not Used
4	Not Used		4	T(+)
5	Common		5	T(-)
6	Not Used		6	Not Used
7	RTS		7	Not Used
8	CTS		8	R(+)
9	Not Used		9	R(-)

LBK/COM/422/485 Option, Comparative Pinouts

LBK/MEM1-U, Expanded Memory (16 MB Upgrade)

The standard 4-MB RAM can be user-replaced with a 16 MB board (LBK/MEM1-U). The expanded memory creates a larger data buffer, allowing more time to swap PC-Cards. This is convenient when using fast scan rates. Note that the 16 MB memory option can also be installed at the factory (LBK/MEM1).

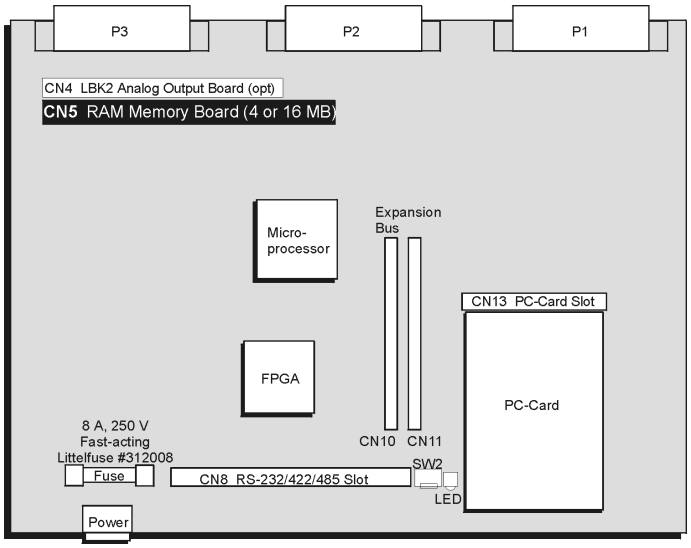
WARNING

Electric shock hazard. Turn off power to all system-connected devices prior to connecting or disconnecting cables, or setting hardware configurations. Failure to do so could result in electric shock or death, and equipment damage, even under low-voltage conditions.

CAUTION

Perform the following procedure using ESD tools, containers, and procedures. One or more related components are sensitive to damage from electrostatic discharge.

1. Turn off system power.
2. Remove LogBook's top cover and locate SIMM socket CN5 (see figure). The CN5, 72-pin socket, holds the RAM Memory Board.
3. Using ESD precautions, depress CN5's two release clips and remove the 4-MB board.
4. Using ESD precautions, insert a 16 MB board (LBK/MEM1-U) into CN5. Note that the board and socket are keyed to mate *one-way-only*, and will lock together when properly mated.
5. Replace the top cover and screws.
6. Turn on system power.



LogBook Motherboard, CN5 Location Reference

Note:
The CN5 slot has two release clips that must be depressed to release the memory card.

The LBK/MEM1-U Memory Board inserts into the CN5 slot on LogBook's Motherboard.


Notes

LBK1, Remote LogBook Terminal

Hardware Description

The LBK1 remote-operation terminal connects to LogBook and provides control of the LogBook *with no computer attached*. With the LBK1, the basic LogBook operations can be controlled with a push of a button; and acquisition data can still be monitored.

LogBook can operate without an LBK1 and with no PC attached. However, such operation requires the use of a programmed PC-card.

Physical Features of LBK1.

- The control panel has a 16-line × 40-character back-lit LCD display (4.25 × 2.25 in.).
- The keypad has 29 membrane switches. Six "soft-keys" are located under the LCD display; their programmed function is shown in the bottom row of the LCD display. Numeric keys are available for entering various parameters in a signed, decimal format. Other keys are used to initiate the manual trigger, mark events, navigate the menu, enter/cancel settings, and turn the system on and off.
- The LBK1 has a beeper to confirm keystrokes; there are no LEDs.
- The LBK1 has one connector (an RJ11) that attaches to the LogBook's DB9 connector via the supplied cable. The supplied cable is 2 ft long. Cable options include: a coiled, retractable cable (6 ft max) and a shielded 3 ft cable to comply with CE standards. Cable lengths up to a maximum of 100 ft from LogBook can be used.
- No batteries are required; LBK1 power comes from the LogBook.
- An optional LBK1 mount can be attached to LogBook for convenient mounting of the LBK1 module.
- The size of the LBK1 is 7.875 × 4.375 × 1.125 in. (200 × 111 × 29 mm).

Capabilities

LBK1's capabilities and limitations are highlighted in the following table. Note that, although LBK1 provides many LogBook functions, it does not provide the degree of control that can be obtained by using a PC and LogView.

Capabilities. The LBK1 can:	Limitations. The LBK1 cannot:
Indicate LogBook power status, acquisition state, and system errors. Provide the user with control to start/stop an acquisition, to initiate a manual trigger, and to mark events. Display channel values numerically: Any measured input channel may be displayed in real time during acquisitions. Any enabled, displayable channel may be displayed if the acquisition is halted. Monitor disk status, showing what percentage of the disk is full. Set LogBook time.	Set up a new acquisition configuration. View charts and graphs. Perform mathematical functions with virtual channels. Run LogView. Internally store data.

LBK1 Installation

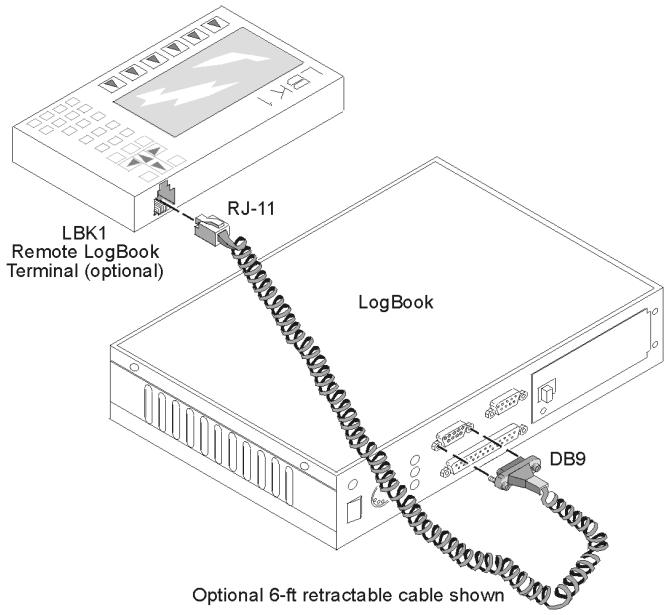
System Connection

1. Connect the supplied cable's DB9P connector to the LogBook's DB9S connector and tighten the locking screws.

   On **LogBook/300** the connector is labeled "FROM CONTROLLER".

   On **LogBook/360** the connector is labeled "TERMINAL (TO LBK1).

2. Connect the cable's RJ-11 connector to the LBK1's corresponding socket.



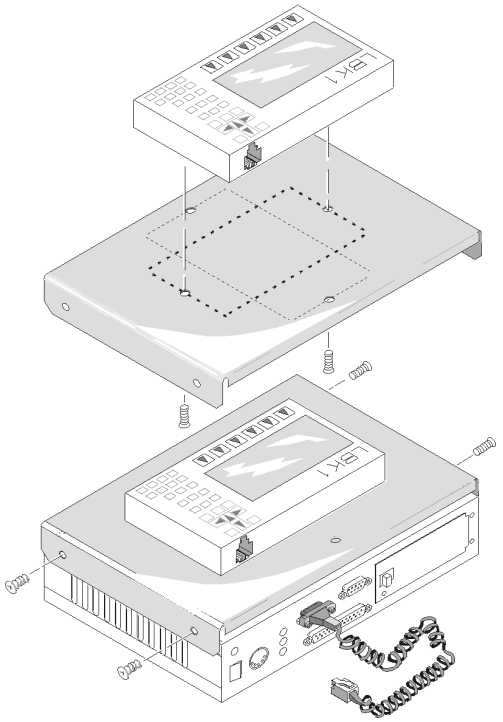
LBK1 with Early-Style LogBook/300

Mounting Rack

An optional mounting rack (p/n Mount1) can be used to hold the LBK1 securely to the LogBook. For convenience, you can mount the LBK1 length-wise or width-wise on the rack (see figure).

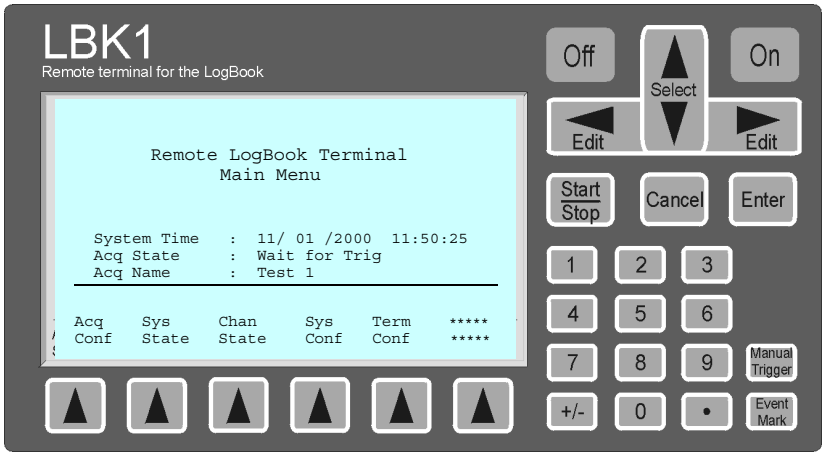
1. Mount LBK1 on the rack in the desired orientation, and attach 2 screws through the rack to the LBK1.
2. Mount rack onto the LogBook, and attach 4 screws to hold the rack to the LogBook.
3. Attach cable, RJ-11 side to the LBK1 and DB9 side to the LogBook.

Note: The mounting rack can be attached to other equipment, racks, shelves, or other support structures.



LBK1 and Rack (p/n Mount1) Shown both Assembled (bottom) and Disassembled (top)
Note: Early-Style LogBook Depicted

Control-Panel Functions



LBK1, Remote Terminal

Menu Select Keys (▲) – Located just below the display screen, these keys access the various menus.

On - Turns power ON to the LogBook. As an indication of power status, legible characters or the LCD backlight shows that LogBook power is on.

Off - Turns power OFF to the LogBook. To prevent accidental shutdown, the user must confirm the "off" request if so configured in the Terminal Configuration submenu.

Select/up/down - Moves the cursor up and down menu to select a particular parameter or function.

Edit/left/right - Views and selects among pre-programmed parameter values; Increases (right) or decreases (left) the numeric quantity.

Enter - Resets parameter values as shown; performs current operation.

Cancel - Discards current operation and restores previous state as last saved.

Start/Stop - Starts an acquisition from idle, or stops an on-going acquisition.

Numeric keypad - Allows entry of signed (+/-) decimal (∗) numbers for setting various parameters.

Manual Trigger - Generates a manual trigger to begin a scan sequence.

Event Mark - Generates an event marker. LogBook records the exact time (to the nearest scan) at which the operator presses the Event Mark button. These marks can be viewed on a PC with the use of a view program such as DIAdem.

LBK1 Menu Map

The following table describes the LBK1 menus that become available via the soft-keys below the LCD display panel. In general, you can scroll through menu parameters by using the Select-up/Select-down keys and through parameter values by using the Edit-left/Edit-right keys. Selections are finalized by using the Enter key; selections are discarded by using the Cancel key or by selecting another parameter.

LBK1 Menu Map

Menu ID	Name/Type/Description	Fields and Parameters
Main Menu	Opening screen with soft-key options for other menus on the bottom line. Other screens can return here by selecting Main Menu at bottom right corner.	**System Time** - reports time registered by LogBook's internal timer **Acquisition Status** - status can be **idle**, **armed**, or **triggered**.
Acq Conf	**Acquisition Configuration** (Read Only) Shows settings from LogView's Acquisition Configuration window. Defines basic trigger parameters using the following submenus.	
	Scan Rate	**Clock Source** - can be internal or external **Base Rate A (Hz) -** can be off or set by LogView **Base Rate B (Hz) -** can be off or set by LogView **Base Rate C (Hz) -** can be off or set by LogView **Base Rate D (Hz) -** can be off or set by LogView
	Acq Set (Acquisition Setup)	**Acquisition Name** - name of the configuration file (*.lvc) that is currently loaded **Number of Re-arms** - infinite or number of repetitions until acquisition is stopped
	PreT Conf (Pre-Trigger Configuration)	**Scans** - the number of scans before the trigger event that will be saved
	Trig Conf (Trigger Configuration)	**Source** - can be immediately, manually, analog channel, digital channel **Date** - to set Absolute Time **Time** - to set Absolute Time **Retrigger** - under absolute Time, set duration to next trigger **Channel** - user label for analog and digital channels **Condition** - can be rising or falling edge for analog or digital channel source **Threshold** - a voltage value for analog channel source **Hysteresis** - a voltage value for analog channel source
	PostT Conf (Post-Trigger Configuration)	**Stop On** - can be manually, analog channel, digital channel **Channel** - user label for analog and digital channels **Scans** - the number of scans before the trigger event that will be saved **Condition** - can be rising or falling edge for analog or digital channel source **Threshold** - a voltage value for analog channel source **Hysteresis** - a voltage value for analog channel source
Sys State	**Acq State** (Acquisition State) Read only; shows system status and resources.	**Arm Time** - displays the arming time of the acquisition **Acq State** - shows acquisition status: **waiting for trigger**, **armed**, or **triggered**. **Pre-Trig Scans** - lists the number of pre-trigger scans already completed. **Post-Trig Scans** - lists the number of post-trigger scans already completed **Trigger Blocks** - lists the number of trigger blocks already completed and stored with current configuration file. **Disk Space Avail.** - lists the number of bytes available on the PC-card. **Disk Space Used** - list the number of bytes saved to the PC-card.
	Error State	**Error Number** - provides a number for error identification **Error String** - identifies the string that contains the error **Error Count** - lists the number of unread errors
	Read Error	Displays the error message.
Chan State	**Channel Status** (Read Only) All channels are listed with their values and units. If multiple pages are used to list channels, each page is numbered in the format "page (1) of (3)".	**User Label** - lists channels by user-designated labels **Reading** - lists the latest reading received from that channel **Units** - lists the dimensional units of the reading; e.g., Volts, PSI, DegC The soft-keys in this menu are used as follows: **AnIN Chans**- to display active analog channels and their current readings **DigIN Chans**- to display active digital channels and their current readings **Calc Chans** - to display calculated channels and their current values **GPS Chans** - to display Global Positioning System Channels

This menu map is continued on the following page.

LBK1 Menu Map (continued)

Menu ID	Name/Type/Description	Fields and Parameters
Sys Conf	**System Info**	Includes the following System Information: **Terminal Firmware Rev.** **LogBook FPGA Rev.** **LogBook OS Rev.** **LogBook Serial Number** **LogBook Model Number** **DAC Option Card Installed (Yes or No)** **Memory Option Size (in MB)** **PC Card Size**
	Set Time	**Time** - reports time registered by LogBook's internal timer **Month** - sets LogBook timer to current month **Year** - sets LogBook timer to current year **Hour** - sets LogBook timer to current hour **Minute** - sets LogBook timer to current minute **Second** - sets LogBook timer to current second
Term Conf	**Terminal Configuration** Allows the user to set parameters for the LBK1 terminal. These values are saved in the LBK1's non-volatile memory.	**Contrast** - sets display contrast from 1 to 25 **Brightness** - sets display brightness from 1 to 25 **Key Sound** - can be yes or no to confirm keystroke **Back Light** - can be yes or no (not using the back light can conserve battery life) **Verify Power Off** - can be yes (when off key is selected, a confirmation screen will ask "power Off" with yes and no soft-keys) or no (selecting the Off key will immediately turn off the LogBook) **Baud Rate** - can select communication speed from listed options

LBK1 - Specifications

Operating Temperature: -20°C to 50°C

Connector: RJ-11

Display: LCD, 16 lines × 40 characters

Power: None required

Dimensions: 7.875 wide" × 4.375" long × 1.125" high; (200 × 111 × 29 mm)


Notes

LBK2, Four Channel Digital-to-Analog Output Option

The optional D/A output board contains four 16-bit, voltage-output, digital-to-analog converters with a maximum update rate of 100 kHz per channel. The board is intended for waveform generation, UUT stimulus, and signal feedback. Each converter has a fixed, full-scale output of ±10 VDC. The board's operation must be programmed through LogView.

The D/A output board has been designed for operation into loads of >2000 Ω resistance with <100 pF of parallel capacitance. The D/A board is stable with all capacitive loads; however, increased capacitive loading will result in longer settling times.

Name: **Analog Output Board**
Output Voltage Range: ±10 VDC.
Voltage Resolution: (1 LSB): 305 µV
Offset Error: ±0.0045 V
Full Scale Error: ±0.01%
Settling Time For 20 Volt Step: <10 µs

The D/A output board is an edge-card design and plugs into a 30-pin SIMM socket. If not factory-installed, the D/A board can be easily installed by the user as follows:

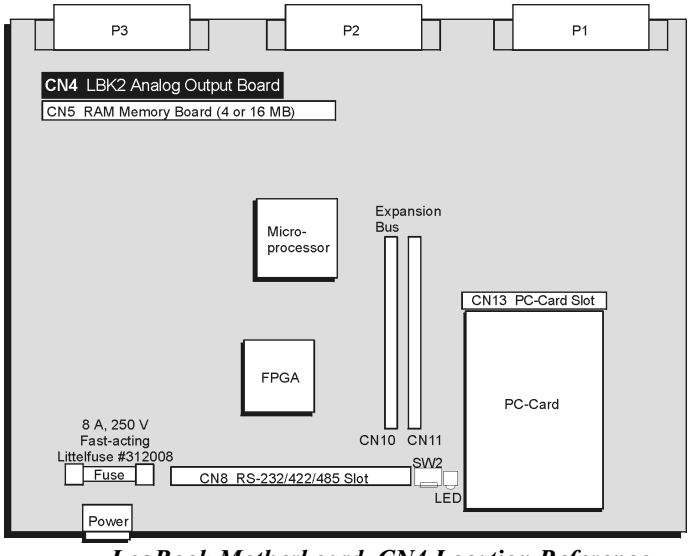
WARNING

Electric shock hazard. Turn off power to all system-connected devices prior to connecting or disconnecting cables, or setting hardware configurations. Failure to do so could result in electric shock or death, and equipment damage, even under low-voltage conditions.

CAUTION

Perform the following procedure using ESD tools, containers, and procedures. One or more related components are sensitive to damage from electrostatic discharge.

1. Turn off system power.
2. Remove the LogBook's top cover and locate CN4 (a 30-pin SIMM socket), see following figure.
3. To gain access to CN4, first remove the RAM memory board from CN5.
4. Using ESD precautions, remove the bypass board from CN4.
5. Using ESD precautions, insert the LBK2 analog output board into CN4. Note that the board and socket are keyed to mate *one-way-only*, and will lock together when properly mated.
6. Using ESD precautions, replace the RAM memory board into CN5.
7. Replace the top cover and screws.
8. Turn on system power.



LogBook Motherboard, CN4 Location Reference

Notes:
CN4 and CN5 slots each have two release clips that must be depressed in order to release cards.

The LBK2 Analog Output Board inserts into the CN4 slot on LogBook's Motherboard.

LBK2 - Specifications

Channels: 4

Connector: DB37 male, P3

Resolution: 16-bits

Maximum Offset Error: ±0.0045 V

Maximum Gain Error of Full-Scale: ±0.01%

Output Voltage Range: ±10 V

Maximum Output Current: 10 mA

Maximum Update Rate: 100 kHz all channels concurrently

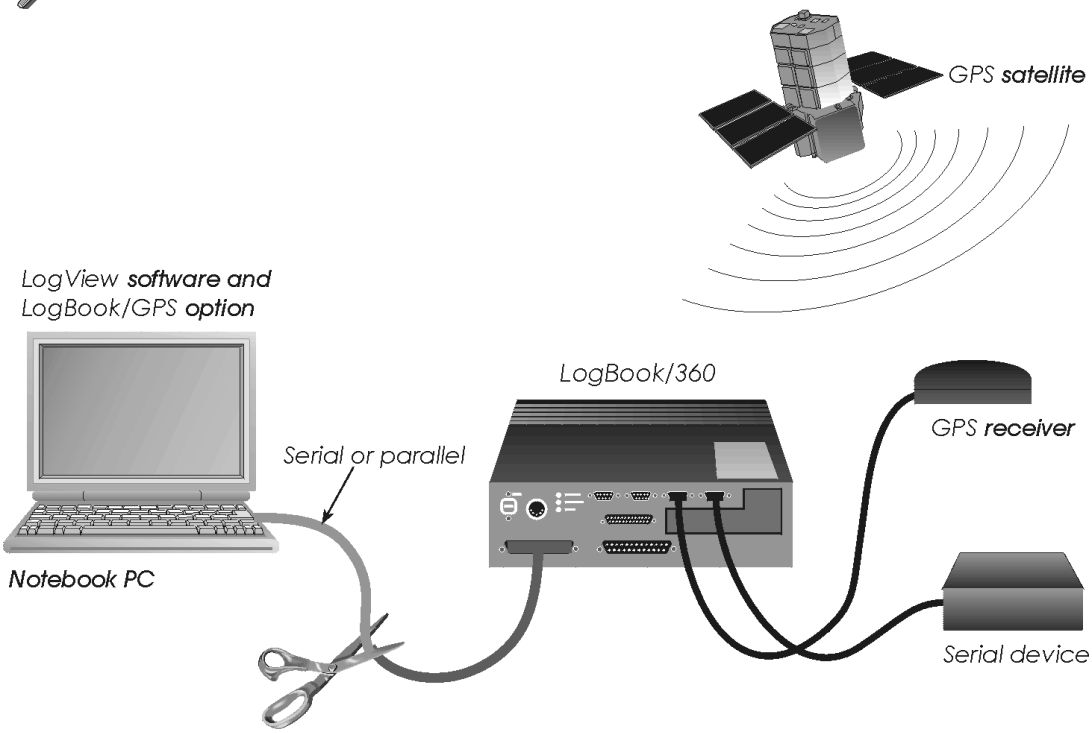
GPS & Serial Device Data Collection (for LogBook/360 Only)

Introduction

The LogBook/360 has two serial ports to which RS-232 devices can be attached. Using the LogView interface, serial data channels can be described that allow the LogBook to collect data from the devices, convert them to channel values, and store them synchronously with its analog and digital inputs.

Although the auxiliary serial ports are standard in the LogBook/360, the serial input software is sold separately as option *LogBook/GPS*. When this option is purchased, an authorization code is provided from the factory that enables the option.

LogBook/300 does not support serial device input.



LogBook/360 Connected to GPS Receiver and a Serial Device

Virtually any serial device that sources continuous ASCII data, including Global Positioning System (GPS) devices, gas flow meters, and scales, is compatible. GPS devices conforming to the NMEA 0183 standard are supported directly in the LogView interface, so no knowledge of the data format is necessary. The GPS receiver must be purchased separately and is available from a variety of sources. For ease of operation, make sure the receiver complies with the NMEA 0183 protocol standard.

Serial Input Fundamentals

Every LogBook input and output is called a channel. When an input channel is enabled, the LogBook will sample and save it at the specified frequency. To collect and save numeric data from serial devices, a *serial channel* must be defined. Each serial channel defines a single number embedded in the ASCII *serial input string* sourced by the serial device. Each serial channel has an associated *format string* that provides the parsing and converting instructions to the LogBook. Up to 16 serial channels can be defined within the LogView software application.

Terms

Serial channel	A serial channel is a LogBook data element, like an analog input channel, that can be collected and stored with the other analog and digital input data. A serial channel defines a single numeric field within the serial data stream sourced by the serial device.
Serial input string	A serial input string is the ASCII data being transmitted by the serial device. Typically, the serial input string contains several numeric and character fields, and is terminated by carriage return (CR) and/or line feed (LF) characters.
Format string	A format string is a user-created character string that contains the instructions necessary for the LogBook to parse out the desired field in the serial input string.

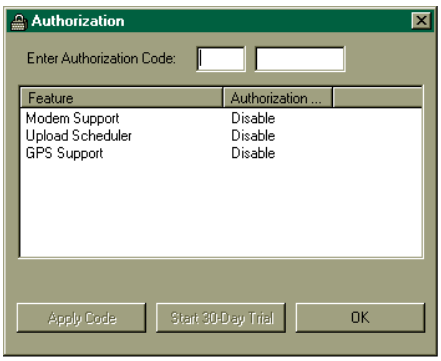
Capabilities and Limitations

Interface type	RS-232 devices.
Data types	The device must supply an ASCII sentence, an ASCII data string terminated by a CR and/or LF. The device must transmit its data without any inducement.

Devices that require a data request command from the controller are not supported.

Serial input string size	The size of a terminated sentence cannot exceed 255 characters.
Number types	Integers (+/-32,768), floats (3.4E+/-38 with 6 digits of decimal precision), and character (+/-128) types are accepted.
Serial channel usage	Like all other input channels in the LogBook system, serial channels can be used in equations defining *calculated channels* and/or used in the definition of the *trigger or stop events*.
Serial baud rate	1200, 2400, 4800, 9600, 38400, 57600, 115200.
GPS port	General serial devices can be attached to either port 1 and/or 2, but a GPS device can only be attached to Port 1.
Synchronicity	The LogBook's analog and digital input channels are synchronously sampled at the specified rate(s) using an internal or externally supplied sample clock. Serial devices provide data to the LogBook asynchronously to its sample clock. When a serial input string is parsed and converted, its value is placed in temporary storage. When the sample clock *fires*, the current value in temporary storage is scanned along with the analog and digital input channels and written to the LogBook's non-volatile PC-Card memory. If the sample rate associated with the serial channel is slow relative to the transmission speed of the serial device, the temporary storage may be updated several times between recorded samples. If the sample rate of the associated serial channel is fast relative to the transmission speed of the serial device, the temporary storage may be sampled and stored many times without any new updates from the serial device.
Data validity	When the system is first armed the serial channel data may be invalid for an undetermined number of scans. Until the serial device provides that which is required by the serial channel definition, the associated serial channel will be invalid. For high sample rates, many scans may be executed before valid data is present on the serial channels.

Installing a New System



For new LogBook systems, perform the following steps to install.

Step 1 Follow the general instructions included with your LogBook for installing your hardware and software.

Step 2 Launch LogView.

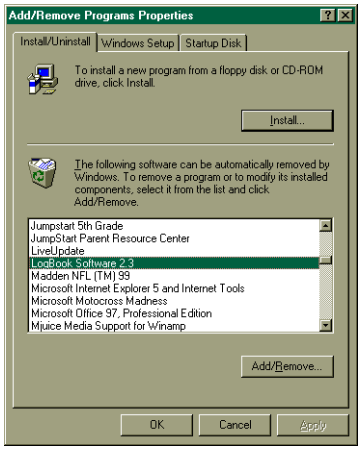
Step 3 Select ***File/Authorization…***

Step 4 Enter the Authorization Code supplied by the factory, then click ***Apply Code***. This code is only supplied when the LogBook/GPS option is purchased. If you haven't purchased the option, but would like to try it out for 30 days, click ***Start 30-Day Trial***.

Step 5 Connect your serial device(s).

Step 6 Close and re-launch LogView.

Upgrading an Older System



When adding the GPS/Serial Input option as an upgrade to an older LogBook system, perform the following steps:

Step 1 Use the *Add/Remove Programs* utility in the *Windows Control Panel* to uninstall your current version of LogView.

Step 2 Insert the upgrade CD. If Autorun is enabled, the setup program will launch automatically. If it's disabled, run SETUP.EXE from the root directory of the CD.

Step 3 In the opening window, select LogBook support and click OK.

Step 4 Follow the on-screen instructions to complete the installation.

Note: It may be necessary to restart your computer when the setup program is complete.

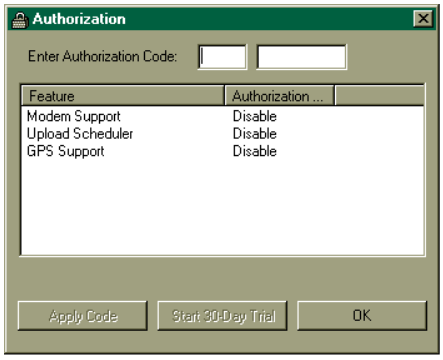
Step 5 After restarting your computer, launch LogView.

Step 6 Select ***File/Authorization***...

Step 7 Enter the authorization code supplied by the factory then click ***Apply Code***. This code is only supplied when the LogBook/GPS option is purchased. If you haven't purchased the option, but would like to try it out for 30 days, click ***Start 30-Day Trial***.

Step 8 Connect your serial device(s).

Step 9 Close and re-launch LogView.



Configuring an Acquisition

What you need to know about your non-GPS device

To successfully capture data sourced by a non-GPS device, you'll need intimate operational knowledge about the device. Use the Operator's Manual shipped with the device to collect information about the following:

Baud rate, parity, stop bits, and data bits	To successfully communicate with the serial device, the LogBook's serial port(s) must be set up to match the RS-232 parameters of the serial device.
Data transmission rate	Typically, serial devices send a block of ASCII data or an ASCII sentence (terminated by CR LF) on a periodic basis—once per second, for example. Knowing this rate will allow you to set up your sample rate for the serial channel(s) intelligently. To capture every value transmitted by the serial device, set the sample rate for the serial channel at about twice the rate of the serial data transmission rate.
Data string	To successfully parse and convert fields within the serial data string, complete knowledge of the string format must be known. For each serial channel, a format string must be created which perfectly describes the expected message. The Windows' Hyperterminal application is sometimes helpful for inspecting the serial strings sourced by a device.

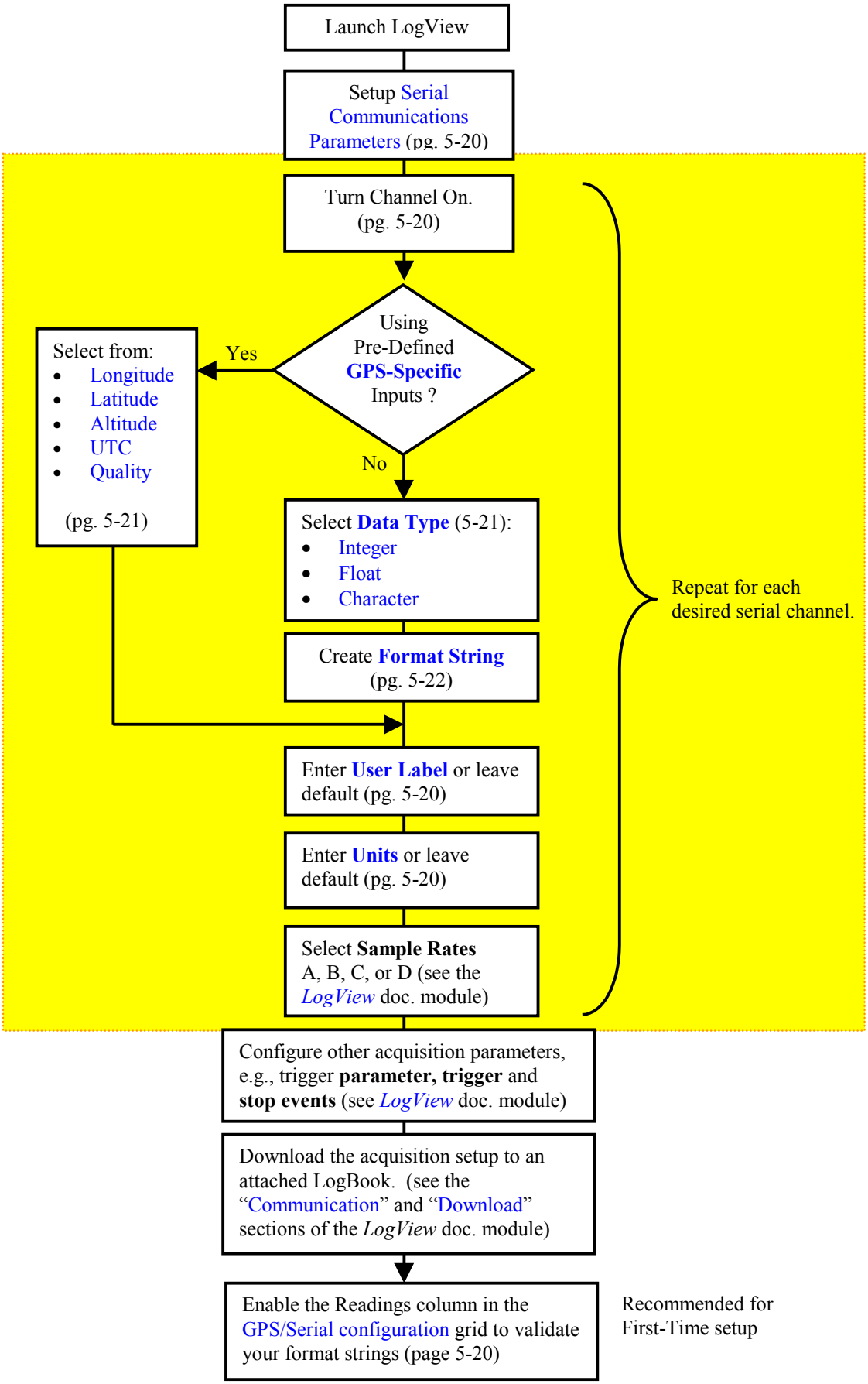
What you need to know about your GPS

The LogBook has direct support for all GPSs that conform to the NMEA 0183 protocol. A GPS of this kind can be connected and operated without any knowledge of the communication or protocol parameters. The included GPS support makes use of the NMEA 0183's *GGA* message, yielding Longitude, Latitude, Altitude, UTC time, and Quality of fix.

If additional GPS parameters are desired, serial channels can be defined to capture them, just like parameters from general, non-GPS devices. To maximize flexibility, user-defined serial channels and pre-defined GPS channels can be used concurrently on the same GPS device. For example, the GPS Longitude channel can be enabled concurrently with a user-defined serial channel that captures the *heading* data from the same GPS.

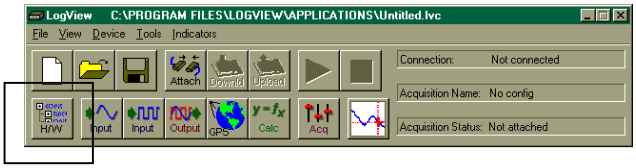
To capture user-defined parameters from the GPS, intimate knowledge of the GPS data strings is required.

Configuration Setup Overview

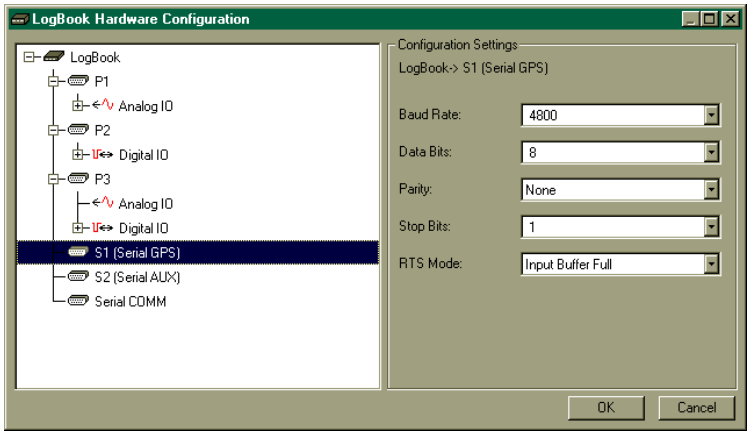


Setting up Serial Communication Parameters

To setup the serial communication parameters of either or both RS-232 ports, open the Hardware Configuration Window.



This window exposes the hardware configuration tree used to configure DBK expansion cards and hardware settings.

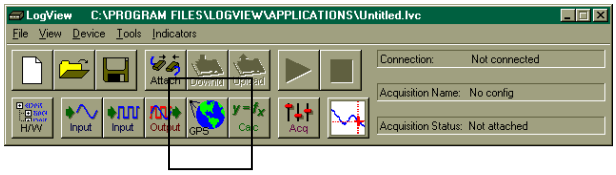


Selecting any of the 3 Serial ports at the bottom of the tree exposes their settings on the right. The bottom-most serial port is the LogBook communication port used to connect the LogBook to a PC or modem. The items labeled S1 and S2 are the 2 serial device input ports. On the LogBook connector panel, the connectors for S1 and S2 are marked "**Serial GPS**" and "**Serial AUX**", respectively. The 1st port is labeled GPS because, if used, a GPS should only be connected to this port. If a GPS is not being used, any serial device can be connected to S1 and/or S2. The default configuration settings for S1 and S2 are designed for standard GPS receivers. If you're using a GPS on S1, leave the settings in their default states. For general serial devices, the baud rate, data bits, parity, and stop bits settings should all be set to match the serial device. The RTS Mode setting regulates the RS-232 handshaking. The *Input Buffer Full* setting enables hardware handshaking. The *Always On* setting disables handshaking.

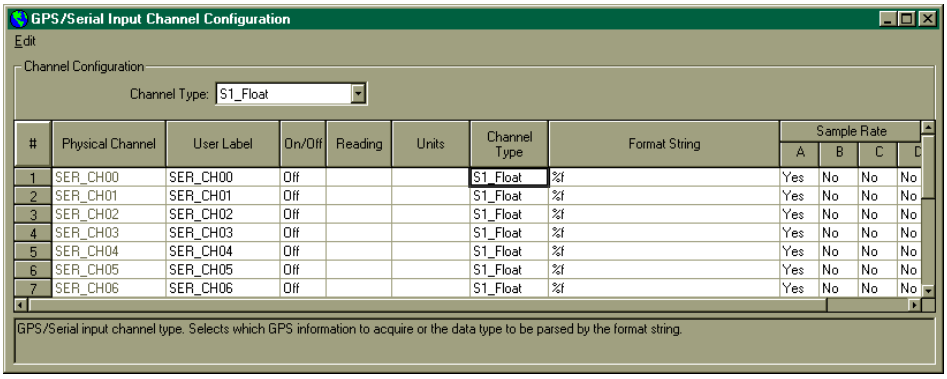
Once the settings for S1 and S2 have been entered, click ***OK*** to close the window.

GPS/Serial Input Channel Configuration

To configure a serial input or GPS channel, click the **GPS/Serial Input** tool in the toolbar. This action will expose the channel grid used to set up the desired serial input channels.



Each row of the grid represents a serial input channel. Up to 16 serial input channels can be defined. As channels are needed, enable them in the **On/Off** column, then select the channel type from the drop down list. The "**Units**" and "**User Label**" columns hold a user-entered string that is stored with the data for data readability, but have no effect on the acquisition.



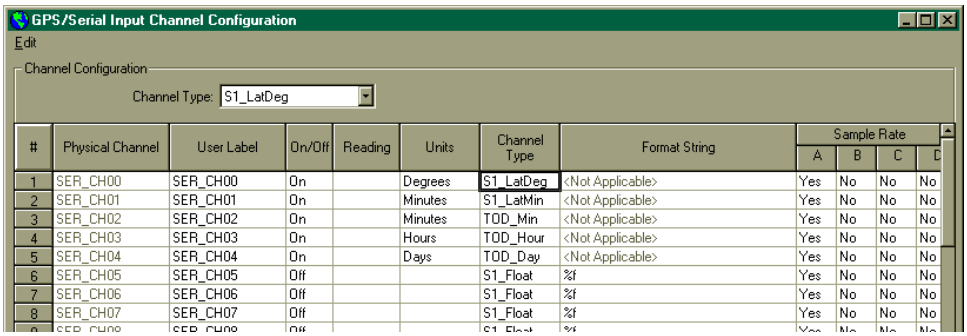
The "**Channel Type**" and "**Format String**" columns define what will be read from the serial device and stored in the associated LogBook channel. In the "Channel Type" column, both the serial port and data type are specified. When an integer, character, or floating point input is selected, LogView will automatically insert the required directive into the format string. The user can then add additional, optional formatting parameters, but *the format string must always end with the directive initially inserted by LogView or a directive of the same number type.*

The following table describes the available settings for Channel Type:

Parameter type	Setting	Description
GPS-specific (on S1 only)	Latitude Degrees	Latitude Degrees is an integer that varies from +/- 90 degrees. A positive number represents the northern hemisphere while a negative number represents the southern hemisphere.
	Latitude Minutes	Latitude Minutes varies from 0 to 60 minutes with 4 digits of decimal precision providing a distance resolution of 0.02 meters.
	Longitude Degrees	Longitude Degrees is an integer that varies from +/- 180 degrees. A positive number represents the western hemisphere while a negative number represents the eastern hemisphere.
	Longitude Minutes	Longitude Minutes varies from 0 to 60 minutes with a variable number of digits of decimal precision, providing a distance resolution of 0.02 meters.
	Altitude	Altitude varies from –11,000 to 21,767 meters with 0.5 meter resolution.
	UTC Time	UTC Time varies from 0 to 86,399 seconds.
	Quality of Fix	The Quality of Fix, provided by the receiver, varies from 0 to 8, providing feedback as to the dependability of the fix information. 0 indicates an invalid fix.
Device Type… General purpose serial device	Integer	Any integer embedded in a string of ASCII serial data.
	Float	Any floating point number embedded in a string of ASCII serial data.
	Character	Any single character embedded in a string of ASCII serial data.
Time-of day parameters for the LogBook's internal real-time clock	mSeconds	Real-time clock milli-seconds ranging from 0 to 875.
	Seconds	Real-time clock integer seconds ranging from 0 to 59.
	Minutes	Real-time clock integer minutes ranging from 0 to 59.
	Hours	Real-time clock integer hours ranging from 0 to 23.
	Days	Real-time clock integer days ranging from 0 to 32767.

Each serial channel represents one and only one number or character. To acquire both Longitude *and* Latitude, for example, two channels must be enabled and set, respectively. When collecting data from a non-GPS device, each desired parameter in the data [sent by the serial device] must occupy a unique channel. If the serial device supplies three parameters and all three are to be collected, then three serial channels must be configured.

When a GPS or time-of-day (TOD) parameter is required, simply select the associated cell in the Channel Type column of the grid, then select the desired parameter from the drop down list. When an integer, float, or character is to be parsed from a serial input string, a format string must be formulated.



The simplest format string can be used if the serial device simply sends one parameter terminated by a CR and/or LF. For example, a scale might send the following:

```
+12.32<CR><LF>
+13.23<CR><LF>
+13.44<CR><LF>
+12.65<CR><LF>
```

In this case, the simple format string %f would instruct the LogBook to start at the 1st character in the serial input string sentence. It would then begin the conversion to a floating point number until a character was encountered that could not be converted. If a %I, for integer, was used instead of %f,
the LogBook would record +12 instead of +12.32.

Format String Reference

The format string provides instructions to the LogBook's internal parser allowing it to parse, then to convert numerically a specified section of an ASCII string from a serial device. The format string contains directives for accepting and rejecting parts of the string. Only one section of each ASCII string can be accepted and converted for each serial channel.

The parsing and converting process begins when the LogBook senses the serial input string sentence, a string from the serial device that is terminated by a CR and/or LF. Each enabled Serial Channel will attempt to parse the entire serial input string. To successfully parse and convert a number or character in a string, all of the characters up to the desired field must be accounted for in the format string. The first character encountered that does not match the format string will cause the parsing operation to fail with no conversion process. The serial channel associated with a failed parsing operation will remain unchanged.

Each format string contains directives to ignore all the characters except those of interest. A format string can contain several optional "ignore" directives, but must contain one and only one "accept and convert" directive. The "accept and convert" directive must be the last item in the format string. A format string can contain any or all of the following:

Format directive	Description	Example	Comment

%Xy	The "%" character signifies the beginning of a conversion directive. "X" is a decimal integer specifying the maximum length of the desired field, while "y" is a character that specifies the conversion type.	`%3i`
		`%c`
		`%6f`
			Convert 1-3 character integer.
			Convert 1 character.
			Convert 1-6 character float.

%*Xy	The "%" followed by the "*" character signifies the beginning of a *rejecting* directive. "X" and "y" are the same as above.	`%*7c%i` `%*i,%i`	Reject 7 characters, convert an integer. Reject 1 integer and a comma, convert 2nd integer.
White space	Tabs or spaces to be taken literally then rejected**.**	`%*i %f`	Reject 1 integer and a space, convert a float.
Regular characters	Literal characters that are to be matched exactly in the serial input string, then rejected	`$GPGGA,%f`	Match and reject "$GPGGA," exactly, convert a float.

Format string examples:

`LOAD:%f`	Match the literal "LOAD:" then start converting a float.
`%*14c%i`	Ignore the 1st 14 characters, then start converting an integer.
`%*i,%*i,%*i,%f`	Ignore 3 integers followed by commas, then start converting a float.

The following table of examples shows how each format string operates on a series of serial input strings:

Serial input string from device	Format Strings Associated with three Serial Channels		
	`LOAD:%f`	`%*14c%i`	`%*i,%*i,%*i,%f`
`LOAD:+12.345<CR><LF>`	+12.345	Failed. After rejecting 14 characters, none were left.	Failed attempting to match 1st integer in format string.
`12,45,23,453.234<LF>`	Failed attempting to match "LOAD:".	34. After skipping 14 characters, the last 2 numbers were converted.	+453.234. Three integers separated by commas rejected.
`11.1 22.2 33.3 44.4 55.5<CR>`	Failed attempting to match "LOAD:".	44. Converted first integer after ignoring 1st 14 characters.	Failed after the 1st decimal point was encountered. The decimal point is neither an integer nor a comma.

Valid Conversion Type Specifiers

c Any sequence of characters in the input stream of the length specified by the field width, or a single character if no field width is specified, is matched.

d A decimal integer, consisting of an optional sign, followed by one or more decimal digits, is matched. Leading white-space characters are skipped.

e, f, g A floating-point number, consisting of an optional sign ("+" or "-"), followed by one or more decimal digits. The **e** specifier accepts scientific notation, i.e., 1.234E+12, while the **f** specifier accepts non-scientific notation values, i.e., 1.1234. The **g** specifier accepts either. Leading white-space characters are skipped.

i An optional sign, followed by an octal, decimal, integer, or hexadecimal constant is matched. An octal constant consists of "0" and zero or more octal digits. A decimal constant consists of a non-zero decimal digit and zero or more decimal digits. A hexadecimal constant consists of the characters "0x" or "0X" followed by one or more (upper- or lowercase) hexadecimal digits. Leading white-space characters are skipped.

o An octal integer, consisting of an optional sign, followed by one or more (zero or non-zero) octal digits, is matched. Leading white-space characters are skipped.

s A sequence of non-white-space characters is matched. Leading white-space characters are skipped.

u An unsigned decimal integer, consisting of one or more decimal digits, is matched. Leading white-space characters are skipped.

x A hexadecimal integer, consisting of an optional sign, followed by an optional prefix "0x" or "0X," followed by one or more (upper- or lowercase) hexadecimal digits, is matched. Leading white-space characters are skipped.

% A conversion type specifier of "%" is treated as a single ordinary character that matches a single "%" character in the input data.

Channel Type Selection Table

The following table shows the required channel type selection for each valid conversion type specifier. This table does not apply to format directives using the *reject* indicator ("*"). The Sx in the table represents serial ports S1 or S2.

Conversion Type Specifier	Description	Required Channel Type	Value Range
c	character	Sx_Char	–128 to 127
d	signed decimal integer	Sx_Int	–32,768 to 32,767
e	scientific notation floating point	Sx_Float	3.4E +/- 38 (7 digits)
f	non-scientific notation floating point	Sx_Float	3.4E +/- 38 (7 digits)
g	either e or f formats	Sx_Float	3.4E +/- 38 (7 digits)
i	optional signed octal, hexadecimal, or decimal integer	Sx_Int	–32,768 to 32,767
o	octal integer	Sx_Int	–32,768 to 32,767
s	string (reject only)	N/A	N/A
u	unsigned decimal integer	Sx_Int	0 to 65535
x	hexadecimal integer	Sx_Int	–32,768 to 32,767
%	N/A	N/A	N/A

GPS Examples

The following block of characters is an example of typical GPS receiver data:

```
$GPRMC,011855,V,4022.1990,N,08249.1990,W,000.0,000.0,150470,006.7,W*6C
$GPGGA,011855,4022.1990,N,08249.1990,W,0,00,,,M,,M,,*44
$GPGSA,A,1,,,,,,,,,,,,,*1E
$GPGSV,3,1,12,12,00,000,,14,00,000,,15,00,000,,16,00,000,*7D
$GPGSV,3,2,12,17,00,000,,18,00,000,,19,00,000,,20,00,000,*7E
$GPGSV,3,3,12,21,00,000,,22,00,000,,23,00,000,,24,00,000,*7E
```

The following example demonstrates how to retrieve information from the first few fields of the Global Positioning System Fix Data (GGA) line:

```
$GPGGA,011855,4022.1990,N,08249.1990,W,0,00,,,M,,M,,*44
```

Field Name	Field Description
Start of Sentence	$
Address Field	"aaccc" where "aa" is the talker identifier mnemonic (GP for Global Positioning System) and "ccc" is the sentence formatter mnemonic (GGA for Global Positioning System Fix Data)
Universal Time Coordinated (UTC)	"hhmmss.ss" where "hh" is hours (0 to 23), "mm" is minutes (00 to 59) and "ss.ss" is seconds (00.00 to 59.99)
Latitude	"ddmm.mm" where "dd" is degrees (0 to 89) and "mm.mm" is minutes (00.00 to 59.99)
Latitude N/S	N=North, S=South
Longitude	"dddmm.mm" where "ddd" is degrees (0 to 179) and "mm.mm" is minutes (00.00 to 59.99)
Longitude E/W	E=East, W=West

The format string of all serial input channels parsing information from the GGA line should start with "$GPGGA," so that all other serial input strings fail to match and are ignored.

One method of parsing the UTC is to create a single channel that parses the entire UTC. In this case, the channel type would be set to "Sx_Float" and the format string would be set to "$GPGGA,%f". The value of the channel for the example line above would be 11855. When parsing the UTC with this method, the channel value can jump when the minutes or hours change (i.e. 11859 to 11900). In this case, "Sx_Int" cannot be used because the UTC can be greater than 32767.

Another method to parse the UTC is to create individual hours, minutes, and seconds channels. The hours and minutes channels would be configured as "Sx_Int" with format strings of "$GPGGA,%2u" and "$GPGGA,%*2u%2u" respectively. Notice that the hours channel parses the first two characters while the minutes channel throws the first two characters away by using the assignment suppression character ("*"), and parsing the next two characters. The second channel would be configured for Sx_Float, so that fractions of seconds could be read, and would use a format string of "$GPGGA,%*4u%f". Notice the seconds channel throws away the four characters that make up the hours and minutes, and parses the remaining characters as a floating point number.

The ASCII value of a single character can be read using the %c format specifier. So the latitude hemisphere character "N" would be read as a decimal 78 (the ASCII value of N). If the channel type is set to "Sx_Char", the value of the channel would be 78 but the LBK1 would display "N".

The following table demonstrates various ways to parse the information contained in the GGA line.

Format String	Comments
$GPGGA,%f	Converts the UTC to a float. The value may jump when minutes and hours change.
$GPGGA,%2u	Convert UTC hours only.
$GPGGA,%*2u%2u	Ignore UTC hours and convert UTC minutes.
$GPGGA,%*4u%f	Ignore UTC hours and minutes and convert seconds.
$GPGGA,%*f,%f	Ignore UTC time and convert Latitude value. This value is in "ddmm.mm" format. Channel value may jump when degrees change, and channel resolution may be large.
$GPGGA,%*f,%2u	Ignore UTC time and convert Latitude degrees only.
$GPGGA,%*f,%*2u%f	Ignore UTC time and Latitude degrees, convert floating point minutes.
$GPGGA,%*f,%*f,%c	Ignore UTC and Latitude, convert N/S character. The value will be recorded as decimal equivalent of the ASCII "N" (XX decimal) or "S" (XX decimal).
$GPGGA,%*f,%*f,%*c,%f	Ignore UTC, Latitude, N/S character, convert Longitude in the format "ddmm.mm".
$GPGGA,%*f,%*f,%*c,%3u	Ignore UTC, Latitude, N/S character, convert Longitude degrees only.
$GPGGA,%*f,%*f,%*c,%*3u,%f	Ignore UTC, Latitude, N/S character, Longitude degrees, convert floating point Longitude minutes only.
$GPGGA,%*f,%*f,%*c,%*f,%c	Ignore UTC, Latitude, N/S character, Longitude, convert E/W character. The value will be recorded as decimal equivalent of the ASCII "E" (XX decimal) or "W" (XX decimal).

If the serial input data is in fixed length format, the format string can be simplified by throwing a number of characters away, rather than whole fields. For example, the Longitude Hemisphere could be parsed using a format string of $GPGGA%*31c%c

Using Serial Channels in Calculated Channels

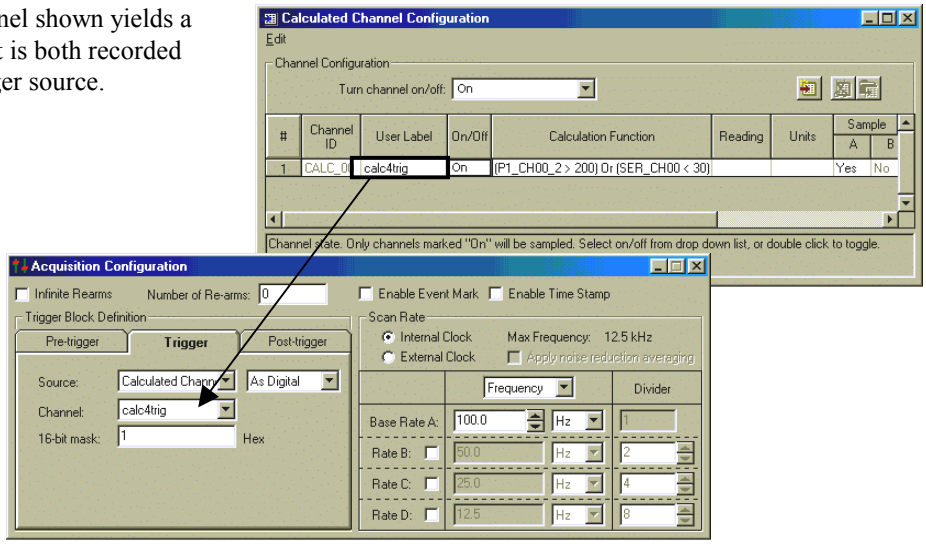
Calculated channels and the LogBook's ability to use them to define trigger and stop events is a very powerful feature. This feature extends to the serial channels, which provide time-of-day data plus information from GPS and general serial devices.

Example Application #1

An RS-232 scale is being used to measure the weight of a liquid fuel while a thermocouple measures engine temperature. The LogBook is to trigger when the temperature exceeds 200F OR when fuel weight is less than 30Kg. This is represented by the calculation function seen in the following figure, where:

(P1_CH00_2>200) Or (SER_CH00<30)

The calculated channel shown yields a true/false output that is both recorded and used as the trigger source.

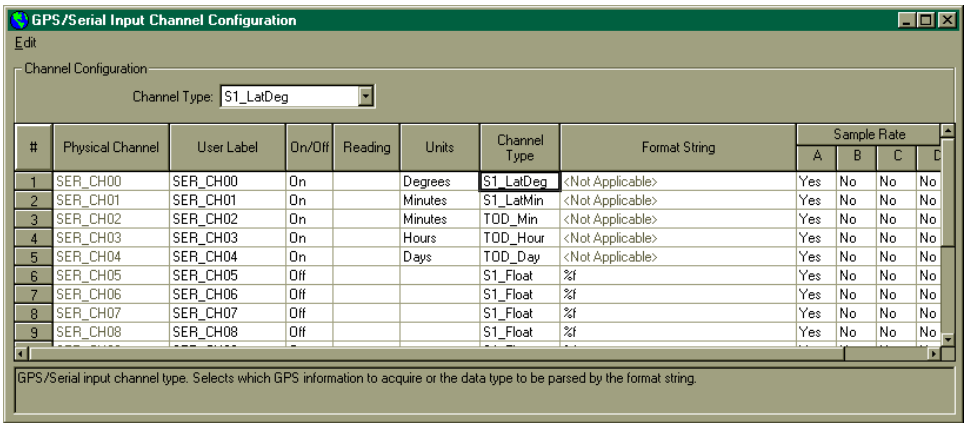


Example Application #2

An oven is being monitored by several thermocouples attached to a LogBook. The LogBook is to trigger whenever the temperature of the oven exterior is above 50C or at 9:00AM each day. The following calculate channel equation yields a true/false output that is both recorded and used as the trigger source.

```
(P1_CH00_2 > 50) Or (SER_CH03 > 9)
```

The serial channel, SER_CH03, is assigned the Channel Type, TOD_Hour



#	Physical Channel	User Label	On/Off	Reading	Units	Channel Type	Format String	Sample Rate A	B	C	D
1	SER_CH00	SER_CH00	On		Degrees	S1_LatDeg	<Not Applicable>	Yes	No	No	No
2	SER_CH01	SER_CH01	On		Minutes	S1_LatMin	<Not Applicable>	Yes	No	No	No
3	SER_CH02	SER_CH02	On		Minutes	TOD_Min	<Not Applicable>	Yes	No	No	No
4	SER_CH03	SER_CH03	On		Hours	TOD_Hour	<Not Applicable>	Yes	No	No	No
5	SER_CH04	SER_CH04	On		Days	TOD_Day	<Not Applicable>	Yes	No	No	No
6	SER_CH05	SER_CH05	Off			S1_Float	%f	Yes	No	No	No
7	SER_CH06	SER_CH06	Off			S1_Float	%f	Yes	No	No	No
8	SER_CH07	SER_CH07	Off			S1_Float	%f	Yes	No	No	No
9	SER_CH08	SER_CH08	Off			S1_Float	%f	Yes	No	No	No

Example Application #3

A GPS receiver is attached to the LogBook to record the present fix of the vehicle under test. The LogBook is to trigger whenever the altitude is above 1000 meters and the fix quality is equal to 3. The following calculate channel equation yields a true/false output that is both recorded and used as the trigger source.

```
(SER_CH02 > 1000) And (SER_CH03 == 3)
```

SER_CH02 is the altitude from the GPS and SER_CH03 is the fix quality from the GPS.

LogBook/GPS - Specifications

Supported Protocol: NMEA 0183

Required NMEA 0183 Message: GGA

Electrical: RS-232

Connection: DB9 female connector

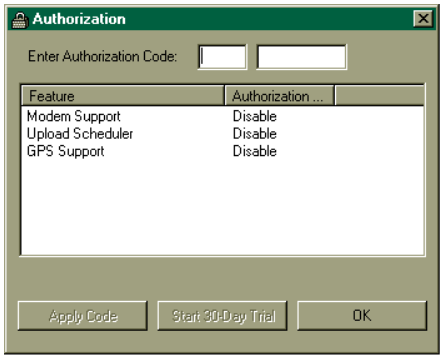
Baud Rate: 4800 Baud

LogBook/Modem, with Upload Scheduler

If the modem [connected to LogBook] has a DTR switch, it should be set to DTR Override. Check the modem for DIP switches on the front or rear. If a DIP switch is present, refer to the modem user's manual. If the DIP switch is for DTR, set it to DTR Override. When DTR Override is set, the DR (Data Ready) LED will light up after turning the modem on.

You must enter a valid authorization code prior to using LogBook's modem support for the first time. To enter the code:

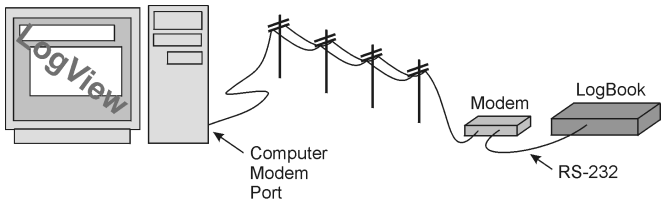
1. Open *LogView*.
2. From *LogView's Control Window*, select the *File* Pull-Down menu.
3. Select Authorization. The *LogView Authorization* dialog box appears.
4. Enter your authorization code to enable Modem Support. If you do not have an authorization code you can obtain one from your service representative, or can enable a 30-day trial period.



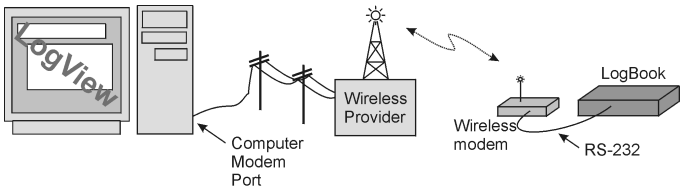
LogView Authorization Dialog Box

OverView

A modem-connected PC can communicate with LogBook virtually anywhere in the world. Any Hayes-compatible modem can be attached to the LogBook's serial port. Both standard desktop and wireless modems are supported.



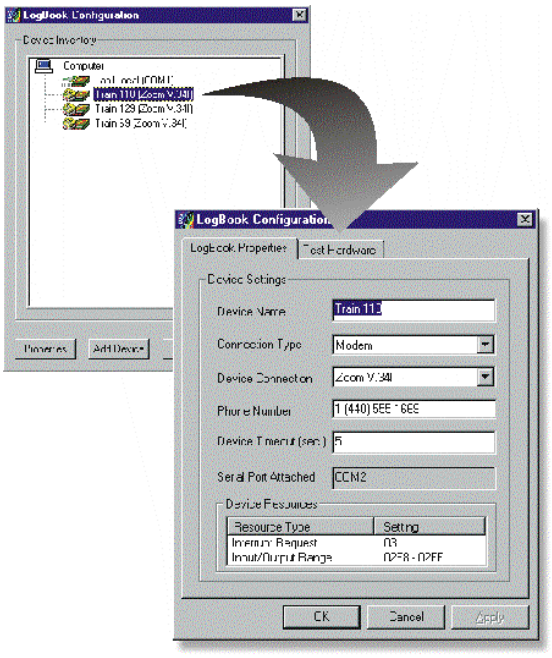
Desktop LogBook System Using A Standard Modem



Mobile LogBook System Using A Wireless Modem

When LogView "attaches" to a remote LogBook, the remote LogBook automatically assumes the baud rate setup by the local and remote modems. This ensures reliable communication at the maximum possible rate. At power-up, LogBook commands the modem to prepare for incoming calls. Operator interaction at the LogBook site is not required to initialize the remote modem. If power to the modem or LogBook is interrupted, when power returns, LogBook will automatically re-initialize the modem.

LogView provides a Windows Control Panel applet for configuring communication attributes of LogBook field units. A virtually unlimited number of connections can be described, each with its own communications attributes and user-assigned name.



Use the Control Panel applet to create LogBook connections

Along with the standard interface choices of serial and parallel port, the applet also allows you to select a modem option and specify an associated telephone number of a remote LogBook.

Within LogView, select a configured LogBook, by name, from the list provided. While engaged with a LogBook (remote or local), LogView can: query the present channel values, check the acquisition status, query the PC-Card status, configure and download a new acquisition configuration, arm and/or trigger the system, and upload collected data. LogView makes no distinction between locally connected LogBooks and those that are attached via modem. For instance, LogView can upload data from a LogBook four feet away (via serial port), or from a LogBook 2000 miles away (via modem).

When attached to a wireless phone modem, a LogBook in a mobile application can be accessed at any time. After LogView attaches to a remote LogBook, collected data can be uploaded from a moving vehicle such as a car, train, bus, truck, or boat. In addition to data uploads, LogView can configure LogBook, report present channel values, and the system status while the device under test is rolling down the road.

With modem support comes an application designed to automate the task of uploading data from one or several LogBooks. This is the *Update Scheduler* (discussed in the next main section).

LogBook, PC, and Modem Systems

LogBook uses two modems: one connected to a host PC with LogView software, and the other to LogBook via an RS-232 connection.

Modems should be connected to analog phone lines. Transfer is always performed at the maximum speed negotiated between the modems when connecting. The Host side of the TAPI interface handles the modem and the connection.

Configuration Utility

LogBook's **LogCpl** ***configuration utility*** provides the interface for creating a device with the following properties:

- **Device Name** (user-defined name for the modem-connected LogBook).
- **Connection Type**. From choices of Parallel Port, Serial Port, and Modem, **select Modem**.
- **Device Connection**. Set to the applicable modem. This can be selected from the list of modems detected on the system.
- **Phone Number** (the number used to call the modem).
- **Device Timeout**. This is a timeout for the Send/Receive attempts. For this application the call timeout is 30 seconds.

Host PC

`LbkTapi.dll` is used to service the modem connection. It is called through **`Lbk.dll`** and **`LbkXport.dll`**. Exported functions are the same as for the other connection types and include:

- **`lbkTAPIOpen`** - opening the device.
- **`lbkTAPIClose`** - closing the device.
- **`lbkTAPIOutput`** - sending data.
- **`lbkTAPIEnter`** - receiving data.
- **`lbkTAPIOnline`** - verify device is online.

Opening the device includes following steps:

1. Showing connection status dialog box.
2. Verifying system is TAPI compatible (**`tapi.dll`** is part of the installation).
3. Checking modem present and ready.
4. Calling the remote modem.
5. Waiting for the ring back.
6. Negotiating connection speed and other parameters.
7. Setting the connection handle and returning connection status.
8. Closing the connection status dialog box.

Note: Connection dialog will display text corresponding to each status phase.

Note: At any time during the connection process, you can terminate the call by clicking the Cancel button (in the Connection Status dialog box). In this case, the **`lbkTAPIOpen`** function will return the corresponding error: **ERR_TAPIOPEN_CANCELED_BY_USER**.

In addition to cancellation by the user, a connection could fail because of the following:

- busy signal
- no dial tone
- modem offline
- wrong number
- remote modem not in auto-answer mode
- remote LogBook offline

In these cases, the error is indicated by connection dialog, and returned to the calling application.

Note: Closing the device includes dropping the call and freeing all modem resources.

LogBook and Modem States

When LogBook is powered-on, software checks for a powered modem attached to the serial port. If a modem is not detected, the check is repeated once a minute until either: the modem is detected, or a serial connection is established.

Modem Detected

If the modem is detected, LogBook sends a series of AT commands to the modem. These set the modem to the initial *auto-answer* state. Once each minute, LogBook checks to see if the modem is in the auto-answer mode. This check continues until a connection is established. This provides for modem recovery, if it was powered-off, then on again.

LogBook software processes messages received from the modem until **RING** and then **CONNECT** messages are received. This means the connection with the Host has been established. The session is terminated when the Host hangs up and LogBook receives the message, **NO CARRIER**. At this point, the initialization procedure is scheduled with a five-second delay. This delay gives the modem time to drop the connection and return to its idle state. LogBook checks for the *auto-answer* state once a minute, waiting for the next session.

Modem Not Detected, Serial Connection Established

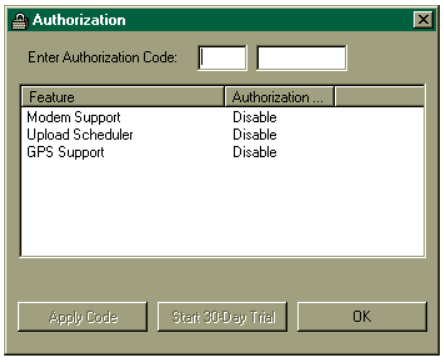
In the case where a modem is not detected, but a serial connection established, all modem activities are suspended; and do not take any of the system's processing time.

Upload Scheduler

The Upload Scheduler is an independent application that allows the user to configure upload events on one or more LogBooks. To avoid waiting for a lengthy upload to complete, the Scheduler can be configured to perform the upload during unattended off-hours. For example, three upload events could be configured in the Scheduler, each for an upload of data at different hours. The Upload Scheduler can save valuable time by performing unattended uploads; especially in cases where modem-connected LogBooks are operating at slow baud rates.

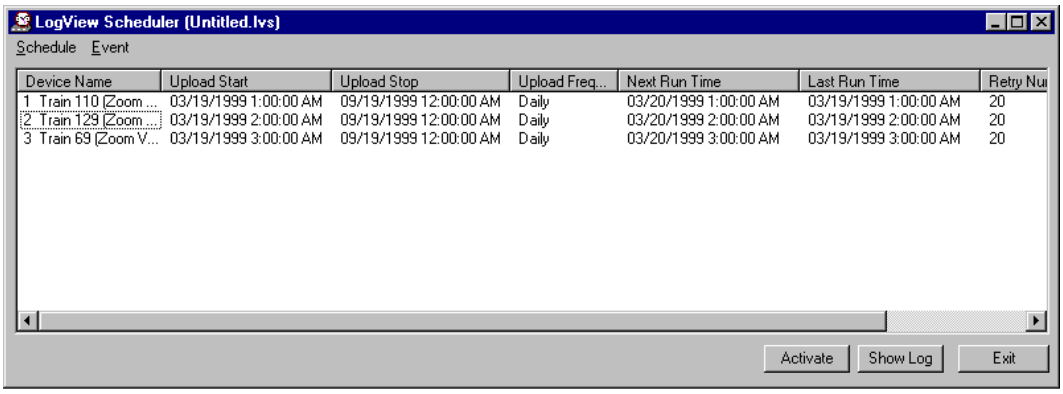
Before using the Update Scheduler for the first time, you must enter a valid authorization code. To enter the code:

1. Open LogView.
2. From LogView's Control Window, select the File Pull-Down menu.
3. Select Authorization. The *LogView Authorization* dialog box appears.
4. Enter your authorization code to enable the Upload Scheduler. If you do not have an authorization code you can obtain one from your service representative, or can enable a 30-day trial period.



LogView Authorization Dialog Box

For applications that require continuous data collection, the Upload Scheduler can periodically upload the data to a local PC, making space on the LogBook's PC-Card memory for more data. For a continuous acquisition, each upload creates a new file called a *data segment*. LogView contains a utility to merge segments, or to concatenate (link) them in one continuous file. Merging and concatenating are discussed in the *LogView* document module.

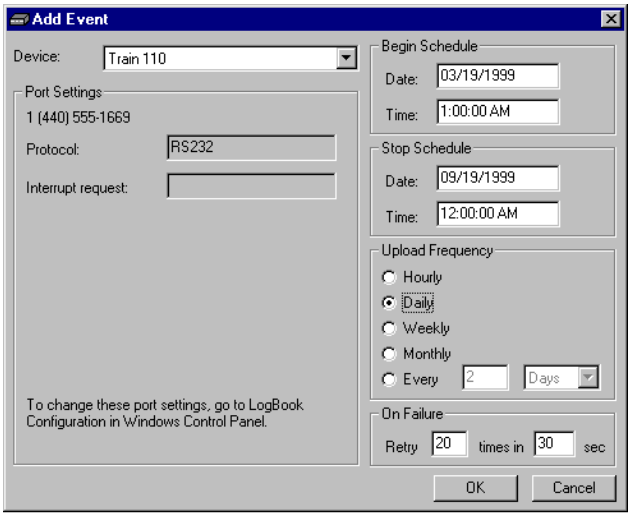


The Upload Scheduler automates the process of uploading data from one or many LogBooks.

In the above example, the Scheduler automatically initiates a session with each LogBook at the specified time and uploads the available data. When the user arrives in the morning, all the data is immediately available for inspection on the PC's hard drive.

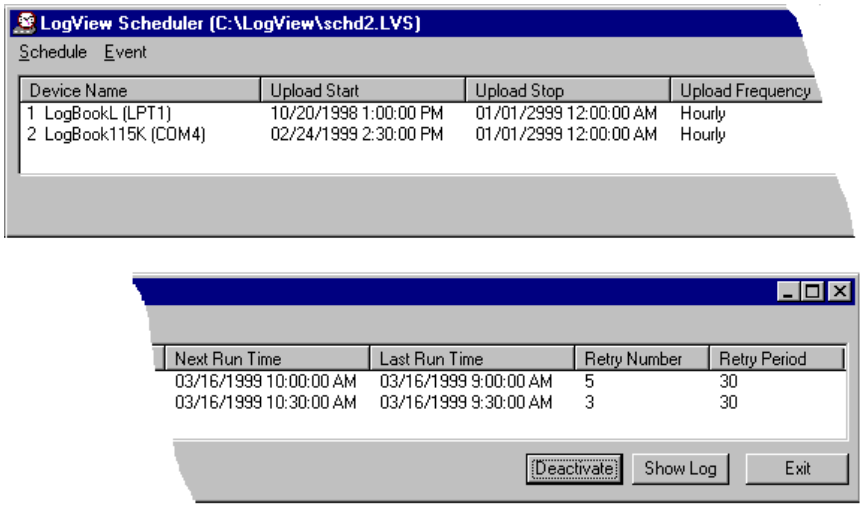
A scheduled event can be configured to execute only one time, or periodically from Begin Schedule time to Stop Schedule time. Periodic configurations can be made for uploads every hour, day, week, or month, without operator intervention.

If the scheduled upload should fail for any reason, LogView will retry the upload the number of times indicated in the *Retry* field. These attempts are initiated at the duration indicated in the *time in* field. The following figure shows that there will be 20 retry attempts. A retry will occur every 30 seconds (until the upload is successful).

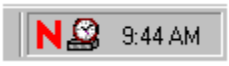


Upload events can execute once or periodically

An "active" Scheduler window is depicted in the following figure. The image has been split so it could be shown in its entirety at its present scale.



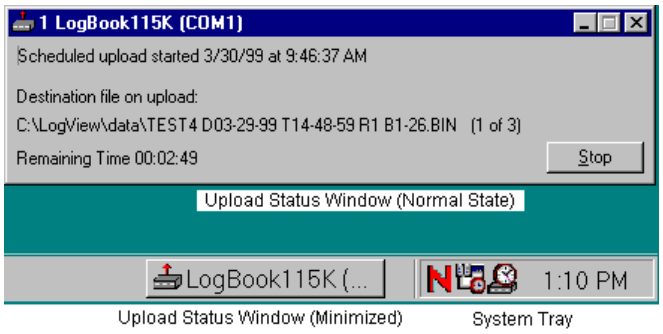
Active Upload Scheduler (split for complete image)



System Tray

When the Upload Scheduler is activated, a Clock/LogBook icon appears in the Windows Desktop System Tray, as shown in the figure at the left.

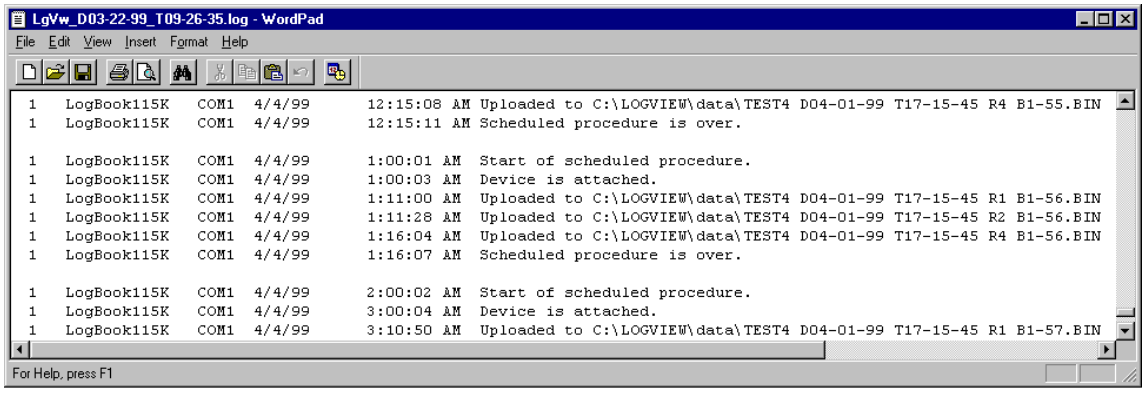
Note: If the Upload Scheduler is active upon computer shutdown, it will automatically activate when the computer is restarted.



Section of Desktop Showing:
Upload Status Window (normal and minimized states) and the System Tray

Each time the Upload Scheduler initiates an upload from LogBook, the application creates a minimized Upload Status window (see previous figure). The Upload Status window provides schedule-related information, such as upload start time, file destination, and time remaining. This window also states when an upload fails; and when a "retry" will be attempted.

The Upload Scheduler saves a report of all its activities to the log file. You can view the log file by clicking Upload Scheduler's "Show Log" button, or by selecting "Show Log" menu item in the Schedule pull-down menu.



Log File in WordPad Default

By default, the Upload Scheduler opens the log file in WordPad. You can choose to open the log file in other applications using the Schedule pull-down menu, Set LogViewer menu item.

The log file will be located in the **\log** subdirectory of the LogView install directory. The Upload Scheduler will generate another log file as soon as the size of the current log file reaches 1MB. The Upload Scheduler will delete the oldest log file from the **\log** directory when the number of log files exceeds 10.

The Upload Scheduler uploads all binary data to the subdirectory **\data** in the LogView installation directory.

LogBook/Modem - Specifications

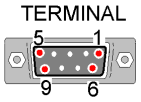
Supported Modems: Hayes-Compatible

Maximum Baud Rate: 115K baud


Notes

Remote On/Off Switch and LED Indicator Options

The DB9 Terminal connector on LogBook/300 and LogBook/360 can be used to connect a remote on/off switch and/or an LED indicator. If you are not using the Terminal connector for another option, such as the LBK1 remote terminal, you may find one of the following three remote options convenient.

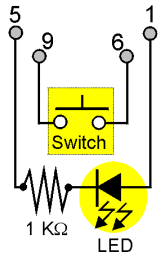


DB9 Connector (female)

Remote On/Off Switch and LED

You can use this option to power your LogBook ON or OFF from a remote location. One *push-and-release* of the button will power the unit on and the indicator LED will light. A second *push-and-release* of the button turns the unit and indicator LED off.

Push-buttons are available that have the LED and resistor built into the switch.



Wiring for Switch and LED Indicator

What you will need:

(a) One "Momentary Contact" switch, contact rating: >5 ma (DC or AC) *Push-button style recommended*.

(b) One Male DB9 connector with twisted-wire, 24 gage or better

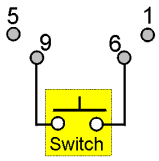
(c) 1K ohm resistor*, rated ≥ 0.125 W

(d) LED rated at <50ma with operating voltage <3 VDC

*You may substitute a 500 ohm resistor to obtain a brighter LED display.

Remote On/Off Switch (no LED)

You can use this option to power your LogBook ON or OFF from a remote location. One *push-and-release* of the button will power the unit on. A second *push-and-release* of the button turns the unit off.



Wiring for Switch Only

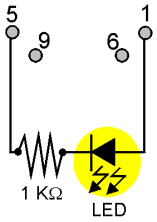
What you will need:

(a) One "Momentary Contact" switch, contact rating: >5 ma (DC or AC) *Push-button style recommended*.

(b) One Male DB9 connector with twisted-wire, 24 gage or better

Remote LED Indicator

You can use this option to indicate when a remote LogBook is powered ON or OFF.



Wiring for LED Indicator Only

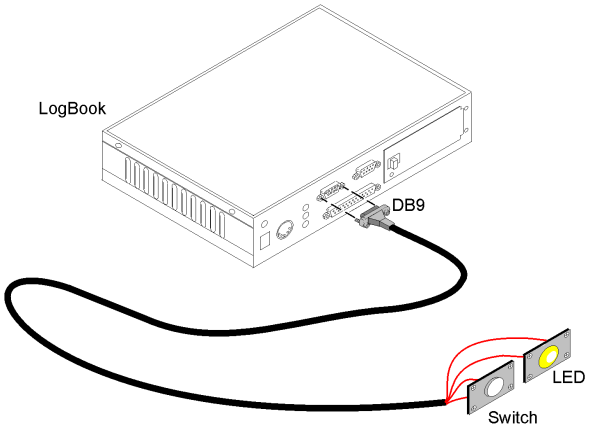
What you will need:

(a) One Male DB9 connector with twisted-wire, 24 gage or better

(b) 1K ohm resistor*, rated ≥ 0.125 W

(c) LED rated at <50 ma with operating voltage <3 VDC

*You may substitute a 500 ohm resistor to obtain a brighter LED display.



LogBook/300 Being Connected to a Remote Push-Button Switch and LED Indicator

Remote Switch and LED Indicator - Specifications

Momentary Contact Switch: >5mA (DC or AC); push-button style recommended

Resistor: 1K ohm, rated at ≥ 0.125 W

LED: <50 mA, operating voltage <3 VDC

CE Compliance 6

Overview

CE standards were developed by the European Union (EU) dating from 1985 and include specifications both for safety and for EMI emissions and immunity. Now, all affected products sold in EU countries must meet such standards. Although not required in the USA, these standards are considered good engineering practice since they enhance safety while reducing noise and ESD problems.

In contracted and in internal tests, most of our products met the required specifications. Products that were not originally in compliance were redesigned accordingly. In some cases, alternate product versions, shield plates, edge guards, special connectors, or add-on kits are required to meet CE compliance.

CE-compliant products bear the "CE" mark and include a *Declaration of Conformity* stating the particular specifications and conditions that apply. Test Records and supporting documentation that validate compliance are kept on file at the factory.

CE Standards and Directives

The electromagnetic compatibility (EMC) directives specify two basic requirements:

1. The device must not interfere with radio or telecommunications.
2. The device must be immune from electromagnetic interference from RF transmitters etc.

The standards are published in the *Official Journal of European Union* under direction of CENELEC (European Committee for Electrotechnical Standardization). The specific standards relevant to LogBook or Daq device equipment are listed on the product's Declaration of Conformity and include: CISPR22:1985; EN55022:1988 (Information Technology Equipment, Class A for commercial/industrial use); and EN50082-1:1992 for various categories of EMI immunity.

The safety standard that applies to LogBook and Daq device products is EN 61010-1 : 1993 (*Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements*). Environmental conditions include the following:

- indoor use
- altitude up to 2000 m
- temperature 5°C to 40°C (41°F to 104°F)
- maximum relative humidity 80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- mains supply voltage fluctuations not to exceed ±10% of the nominal voltage
- other supply voltage fluctuations as stated by the manufacturer
- transient over-voltage according to installation categories (over-voltage categories) I, II and III For mains supply, the minimum and normal category is II.
- pollution degree I or II in accordance with IEC 664

For clarification, terms used in some Declarations of Conformity include:

- **pollution degree**: any addition of foreign matter, solid, liquid or gaseous (ionized gases) that may produce a reduction of dielectric strength or surface resistivity. A **pollution degree I** has no influence on safety and implies: the equipment is at operating temperature with non-condensing humidity conditions; no conductive particles are permitted in the atmosphere; warm-up time is sufficient to avert any condensation or frost; no hazardous voltages are applied until completion of the warm-up period. **Pollution degree II** implies the expectation of occasional condensation.

- **overvoltage (installation) category**: classification with limits for transient over-voltage, dependent on the nominal line voltage to earth. Category I implies signals without high transient values. Category II applies to typical mains power lines with some transients.

Safety Conditions

Users must comply with all relevant safety conditions listed in the Declarations of Conformity and in the user documentation. This manual, LogBook, and Daq device hardware use the following Warning and Caution symbols:
(If you see these symbols on a product, carefully read the related information and be alert to the possibility of personal injury).

This warning symbol is used in this manual or on the equipment to warn of possible injury or death from electrical shock under noted conditions.

This warning/caution symbol is used to warn of possible personal injury or equipment damage under noted conditions.

LogBook and Daq device products contain no user-serviceable parts; refer all service to qualified personnel.

The specific safety conditions for CE compliance vary by product; but general safety conditions include:

- The operator must observe all safety cautions and operating conditions specified in the documentation for all hardware used.
- The host computer and all connected equipment must be CE compliant.
- All power must be off to the device and externally connected equipment before internal access to the device is permitted.
- Isolation voltage ratings: do not exceed documented voltage limits for power and signal inputs. All wire insulation and terminal blocks in the system must be rated for the isolation voltage in use. Voltages above 30 Vrms or ±60 VDC must not be applied if any condensation has formed on the device.
- Current and power use must not exceed specifications. Do not defeat fuses or other over-current protection.

Emissions/Immunity Conditions

The specific immunity conditions for CE compliance vary by product; but general immunity conditions include:

- Cables must be shielded, braid-type with metal-shelled connectors. Input terminal connections are to be made with shielded wire. The shield should be connected to the chassis ground with the hardware provided.
- The host computer must be properly grounded.
- In low-level analog applications, some inaccuracy is to be expected when I/O leads are exposed to RF fields or transients over 3 or 10 V/m as noted on the Declaration of Conformity.

CE Enhancements for Existing Products

This section describes three CE enhancements.

- DBK41/CE
- Edge Guards for the DBK5, DBK8, and DBK44
- BNC Connectors for CE compliance

Edge Guards for DBK5, DBK8, and DBK44

A plastic barrier attached to the end of a DBK card helps prevent access to leads, and to live circuits. The edge guards attach to DBKs (see figure below) that are mounted in a DBK41/CE, with EMI shield plates. The access slot allows insulated wires to pass through the barrier.

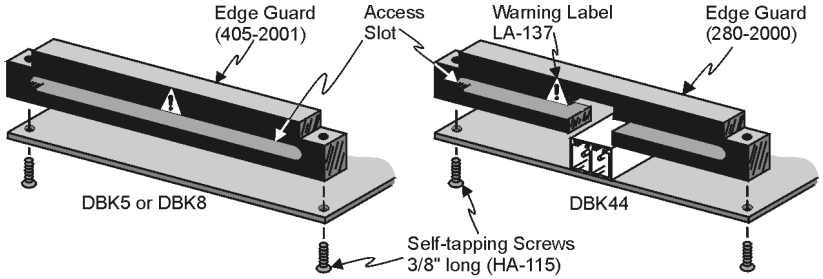


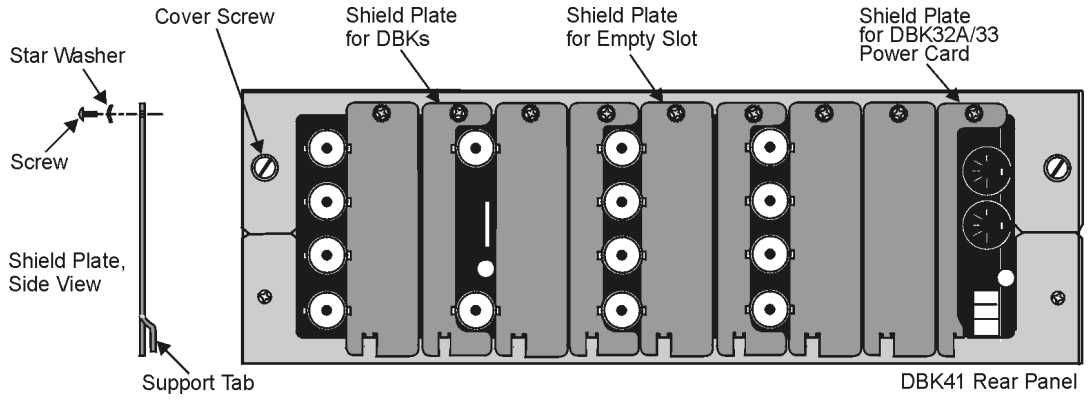
Fig 1. Edge Guard Kit for DBK5 and DBK8
(p/n 232-0806)

Fig 2. Edge Guard Kit for DBK44
(p/n 232-0805)

DBK41/CE

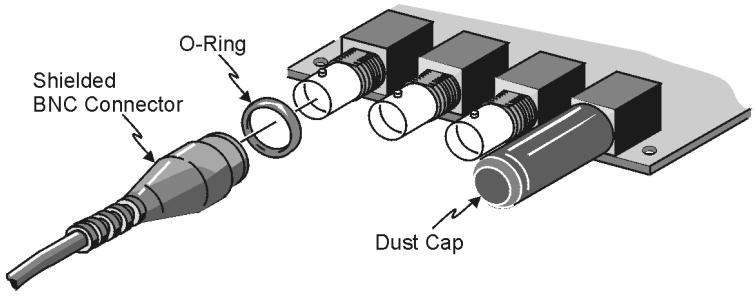
The DBK41/CE includes 3 variations of EMI shield plates that attach to the DBK41 enclosure. Besides acting as an electrical safety barrier, these shields reduce electromagnetic interference (EMI).

Note: The CE kit is included with the DBK41/CE. It can be purchased as an optional accessory for use with DBK41.



BNC Connectors for CE Compliance

Exposed BNC connectors can receive static charges, which can enter the board's circuitry, resulting in ESD damage. To comply with CE standards, BNC connectors must be shielded from high-voltage sources such as static charges.



Some points:

- Cable and connector requirements are stated in the product's *Declaration of Conformity*. These are typically special coaxial cables with insulated end-connectors and rubber O-rings, for example, cable kit p/n 418-0800.
- PVC dust caps (p/n CN-96) must cover all unused BNC connectors.
- Properly installed connectors and dust caps will cover the entire surface of the BNC, i.e., no BNC metal will be exposed.

LogView

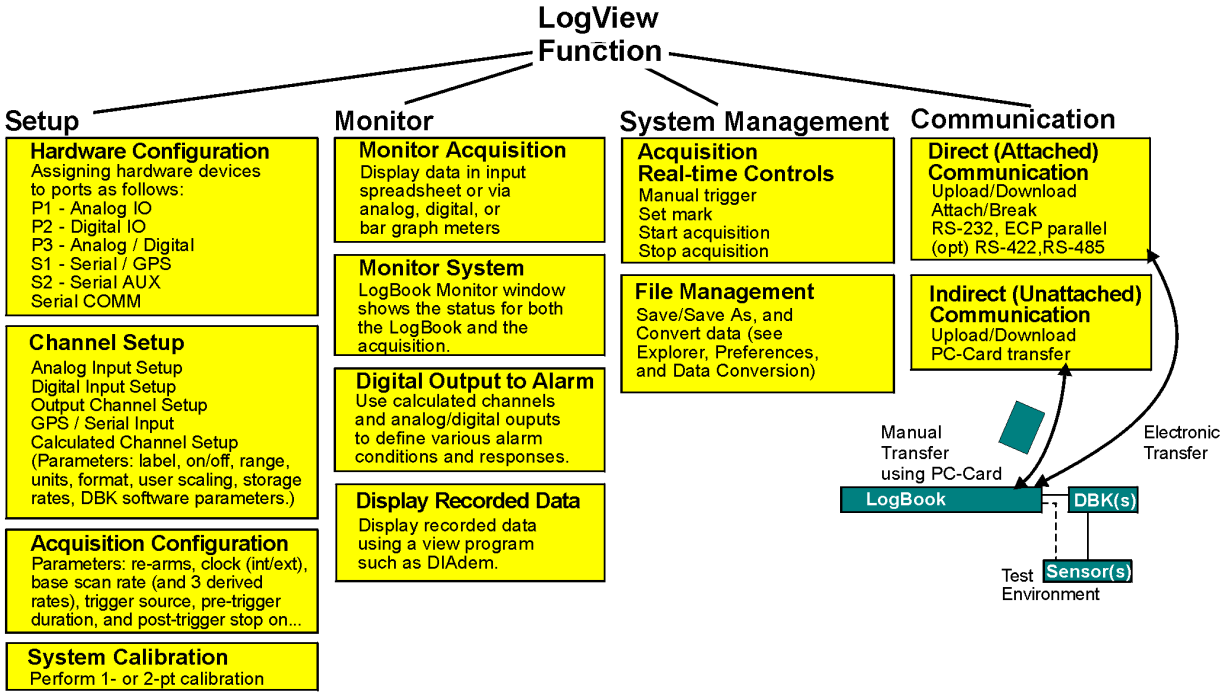
Understanding LogView

LogView provides for easy setup and operation of LogBook. *LogView's* flexibility can handle virtually any data-acquisition environment. The graphical Windows interface can display a variety of spreadsheets, dialog boxes, graphs, charts, and meters; and accepts user input from a mouse and keyboard. The easy-to-learn interface does not require programming or the configuration block diagrams.

It is important to understand the central role of the PC-Card in LogBook/*LogView* operation. When LogBook operates in a *stand-alone mode* (not attached to the PC), *LogView* must download the system and acquisition setup files to a PC-Card. The PC-Card must then be manually transferred to LogBook. Later LogBook's PC-Card must be transferred back to the PC for uploading. When LogBook and PC are attached in direct communication, *LogView* can download to [or upload from] LogBook in real time via the communications link.

Modes of *LogView* Operation

The next figure outlines *LogView's* functional modes to help you visualize what *LogView* can do. This functional organization is not the same as the menu organization.



Setup

System **Setup** includes the hardware, the channels in the scan, and the triggering. Before data acquisition can begin, all setups must be complete and the resulting setup file downloaded to the PC-Card in LogBook.

- **Hardware Configuration** asks you to set the software parameters to match your hardware. For some DBKs, you may need to adjust the DBK's jumpers and DIP switches—or at least verify that the *LogView* software setting matches the DBK hardware setting (pg. 30).
- **Channel Setup** pertains to using LogView to set the different types of channel parameters. These include label. On/off, range, units, format, user scaling, storage rates, and DBK software parameters. The types of channels that are set up through LogView are: Analog Input (pg. 31), Digital Input (pg.35), Output Channels (pg.36), GPS/Serial Input (pg.37), and Calculated Channels (pg.37). The flexibility of the Calculated Channel allows you to create a virtual channel based on math and logic functions of real channels (analog and digital), other virtual channels, and arbitrary numerical values.
- **Acquisition Configuration** asks you to determine when, how often, and for how long to get data readings. Trigger/pre-trigger/post-trigger conditions and timebases are discussed on page pg.43.
- **System Calibration** allows you to perform 1- or 2-pt calibrations to fine-tune system accuracy.

Monitor

- **Monitor Acquisition**. In real-time, *LogView* can display system parameters and channel values in a spreadsheet style. If so desired, readings can be formatted into bargraphs, analog meters, and digital indicators (pg.55).
- **LogBook Monitor** shows you the status of the current acquisition and the LogBook system (pg.49).
- **Programmed Digital Outputs Used As Alarms**. The monitoring function can be automated via calculated channels and digital outputs to engage alarms when pre-defined conditions occur.
- **Display Recorded Data**. allows you to graphically view previously recorded data for analysis and comparison via a post-acquisition "view" program. The applicable "view" application is covered by PDF documentation that is automatically installed onto your PC's hard-drive as a part of LogBook product support, during software installation.

System Management

LogView allows you to manage aspects of an acquisition in progress and file saving/conversion:

- Direct **Acquisition Controls** of LogBook include manual triggering and setting reference marks (via LogBook Monitor, pg.49) and starting/stopping an acquisition. In these ways, *LogView* gives you immediate access to LogBook operation.
- **File Management** includes managing data/configuration files and converting data file formats. The *LogView* Explorer window allows you to manage files on the PC-Card.

Communication

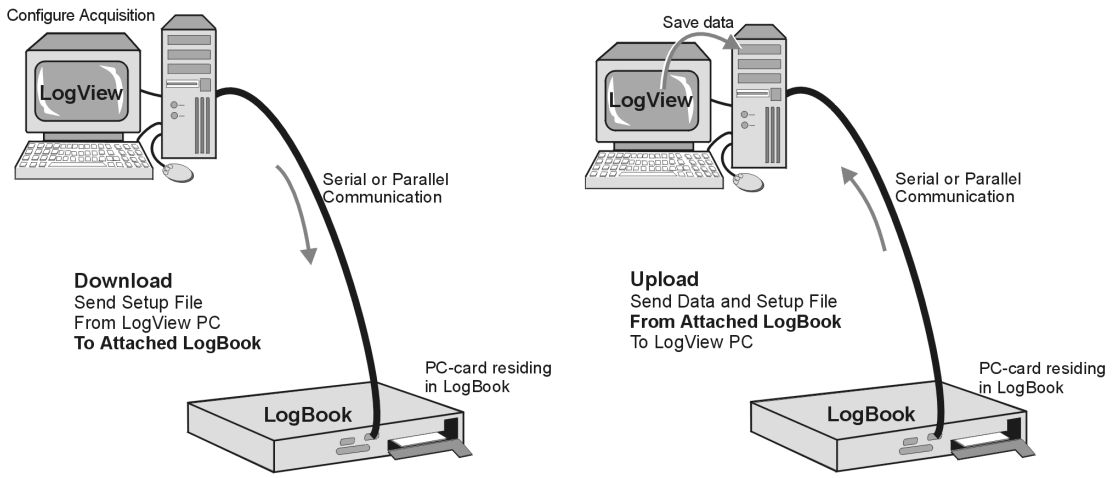
Communication between *LogView* and LogBook is actually between the PC and a PC-Card. During the communication, the PC-Card can reside in a LogBook for **direct (attached) communication** or in the PC's PC-Card socket for **indirect (unattached) communication** (and later manually transferred to LogBook).

Whether direct or indirect, communication involves downloading and uploading:

- **Downloading** sends the acquisition setup file (created in *LogView's* Setup mode) to LogBook's PC-Card. LogBook uses the setup file to run the acquisition (also needs **`logbook.sys`**).
- **Uploading** receives recorded data from LogBook's PC-Card. After the data has been collected and temporarily saved on LogBook's PC-Card, the data must be uploaded to *LogView* for processing, conversion, use in other programs, and/or archival saving.

In the **Direct (Attached) Communication** mode, communication occurs through the electronic connection (cabling via serial or parallel port). While attached, LogBook can do 2-point calibration, look at current readings, and download/upload without handling the PC-Card.

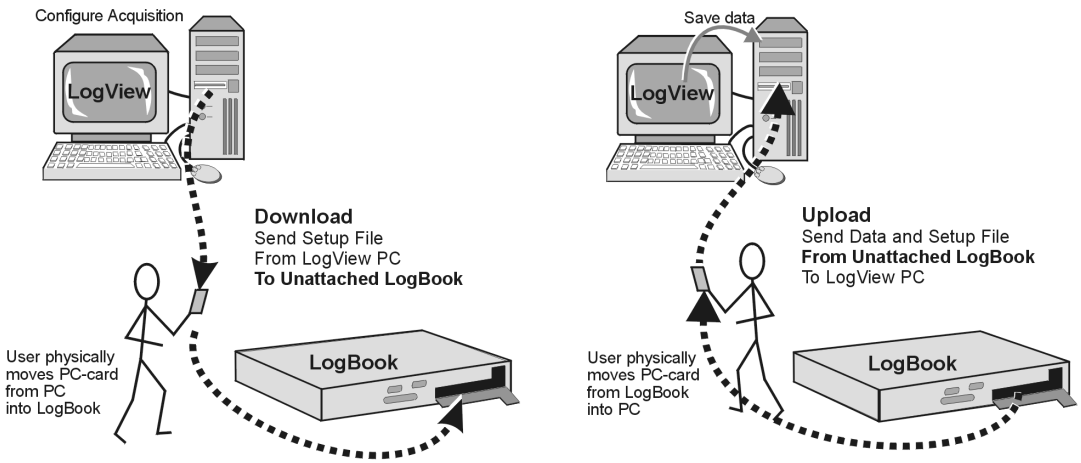
Note: In some cases, data transfer may be faster by placing LogBook's PC-Card in the computer's PC-Card socket and bypassing the attached communication.



Direct Downloading and Uploading With Attached PC

In the **Indirect (Unattached) Communication** mode, no electrical connection exists between the PC and LogBook. A PC-Card carrying the setup file and/or data must be physically transported between the PC and LogBook.

Note: The LBK1 remote operation terminal can be used with an unattached LogBook for limited control and monitoring. The LBK1 option is detailed in chapter 5 of the LogBook User's Manual.



Indirect Downloading and Uploading With Unattached PC

LogView Features and Capabilities

In setting up an acquisition, *LogView* can:

- Configure parameters for all input, output, and calculated channels without using special programming skills.
- Provide flexible triggering to acquire continuous data, capture exceptions or, to trigger based on calculated channels.
- Configure and operate expansion chassis, including the DBK option cards and modules designed for various signal-conditioning environments.
- Provide utilities (convert units, calibrate sensors, calculate channels, control outputs/alarms, etc).

In handling data, *LogView* can:

- Download an acquisition setup file to a PC-Card for physical transport to a remote LogBook, or send the setup file directly to the PC-Card in a LogBook via the serial or parallel port.
- Upload the recorded data from LogBook by corresponding means.
- Create files for use by other Windows programs; e.g., database or analysis.

Utility-wise, *LogView* can:

- Calibrate all gains and offsets on a per-channel basis.
- Launch a separate "view" program that allows you to graphically view pre-recorded data.
- Interact with LogBook while the acquisition is taking place including manual trigger and event marking.

In monitoring an acquisition, *LogView* can:

- Display readings and status in real-time. On-screen indicators provide channel feedback during an acquisition. Channel values can be displayed in charts, bar graphs, analog meters, or digital readouts.
- Show system status including trigger status, errors, alarms, etc.

Software User-Interface

LogView's user-interface uses a control window with toolbar/menus and a spreadsheet model. Similar to other Windows-based programs, *LogView's* user interface will seem familiar and intuitive. Windows can be sized and placed to best fit your application. Several different meter styles are available to monitor data in real time if so desired.

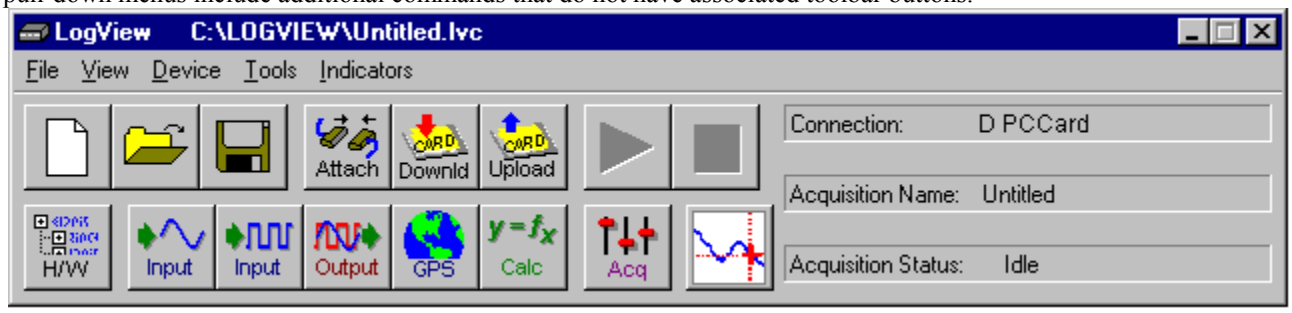
Control Window (Pull-Down Menus and Toolbars)

File	View	Device	Tools	Indicators
New	Hardware Configuration	Select PC Card	Convert Binary Data	Bar Graph Meters
Open	Analog Input Channels	Select LogBook	Merge Binary Data	Analog Meters
Save	Digital Input Channels	Attach	View Data	Digital Meters
Save As	Output Channels	Break		Enable Input Reading Column
Download	GPS/Serial Input Channels	Arm Acquisition		Start All Indicators
Upload	Calculated Channels	Stop Acquisition		Stop All Indicators
Download As	Acquisition Configuration	LogBook Monitor		
Configuration Report	Preferences	Explorer		
About LogView				
Authorization				
Exit				

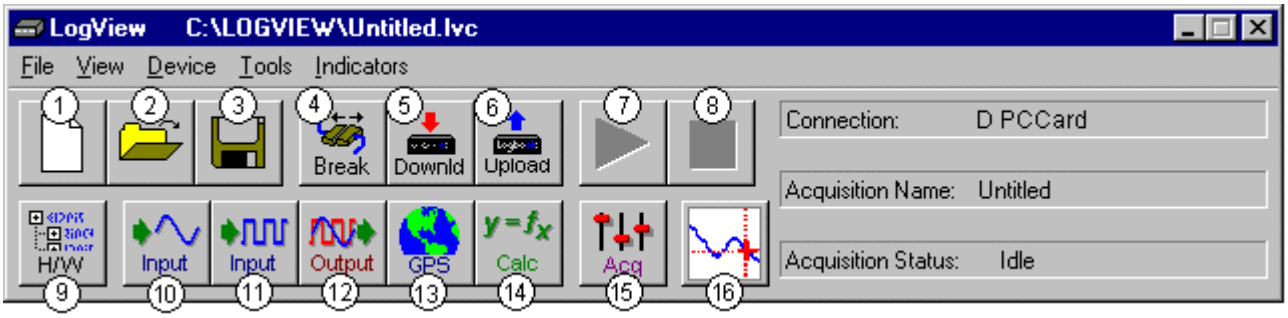
LogView Pull-down Menu Selections

LogView pull-down menus, represented by the above table are discussed in the section, *Menu Descriptions*. The following figure shows *LogView's* control window. Note that two sets of toolbar buttons reside just below the menu row.

Toolbar commands can be accessed in two ways: (1) via toolbar, or (2) via pull-down menu selection. Note that the pull-down menus include additional commands that do not have associated toolbar buttons.



LogView Control Window – LogBook Unattached



LogView Control Window – LogBook Attached

Legend

1 – New Setup File

2 – Open Setup File

3 – Save Setup File

4 – Break PC from LogBook (*Shows when PC is attached*), or
– Attach PC to LogBook (*Shows when PC is unattached*)

5 – DownLoad to LogBook (*Shows when PC is attached*), or
– DownLoad to PC-Card (*Shows when PC is unattached*)

6 – UpLoad Acquisition Setup & Data to LogBook
(*Shows when PC is attached*), or
– UpLoad Acquisition Setup & Data to PC-Card
(*Shows when PC is unattached*)

7 – Arm (Start) Acquisition

8 – Stop Acquisition

9 – Hardware Configuration

10 – Analog Input Setup

11 – Digital Input Setup

12 – Output I/O Setup

13 – GPS (Global Positioning System) / Serial IN Setup Option

14 – Calculated IN Channel Setup

15 – Acquisition Configuration

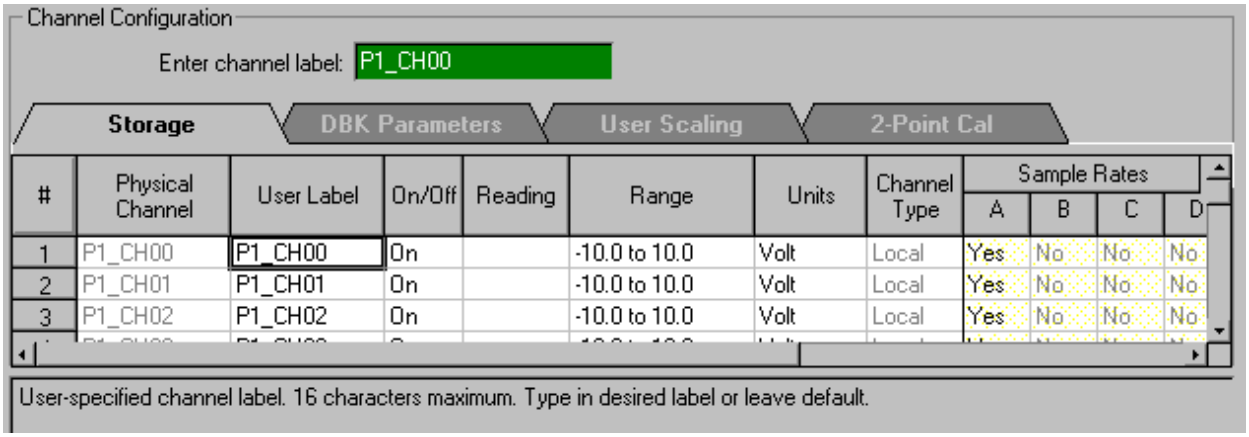
16 – View Data [via a post acquisition view application]

Spreadsheet Model

LogView's interface uses a **spreadsheet model** of cells in rows and columns (see next figure):

- **Each row is a different channel**. Individually-controlled channels can be hardware-based or calculated; channels can be identified with user-specified labels.
- **Each column is a parameter related to the channel**. Some parameters can be user-set (user label, sample rate, etc.); others are read only (physical channel, readings from transducers, etc.).

Note: Generally, cells that are "grayed-out" rather than black are not subject to user input (e.g. physical channel, channel type); however, grayed-out Sample Rates under the Storage tab can be changed in the Acquisition Configuration Window.



Analog Input Channel Configuration Window, Spreadsheet Portion

LogView's spreadsheet-style setup provides a simple method of both viewing and configuring the parameters of the input, output, and calculated channels. Several spreadsheets are needed to display all the channels' parameters. *LogView*'s spreadsheet windows include:

- **Analog Input Channel Configuration** (see page pg.31 for details) - This default-opening window has more parameter columns than will fit in view at one time. Therefore, the left-most (white) columns are shown in every view; these parameters include: Physical Channel, User Label, On/Off, Reading, Range, Units, and Channel Type. The right-most (shaded) columns vary depending on which folder tab is selected. Each tab (Storage, DBK Parameters, User Scaling, and 2-Point Calibration) has
tab-specific parameters.
- **Digital and Counter Input Channel Configuration** (see page pg.35) - LogBook has three 8-bit digital ports and one high-speed 16-bit port configurable as inputs or outputs. Digital expansion cards can provide up to 192 digital bits. There are also 4 pulse-input ports that can count pulses for summing and/or frequency measurement.
- **Output-Channels Configuration** (see page pg.36) - This window shows all the currently-available digital and analog output channels. Each output channel is fed by a user-set source channel. Source channels can be chosen from any of the input (hardware) channels or calculated (virtual) channels.
- **Calculated-Channel Configuration** (see page pg.37) - *LogView* can derive virtual channels using standard math operators and functions (<, >, min, max., etc.). Virtual channels can be used to create alarms, reduce data statistically, develop sophisticated trigger equations, and manipulate input channel values for more useful output including simple control systems.

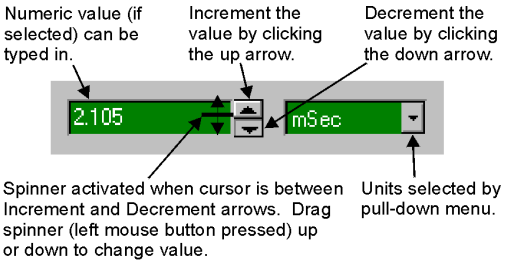
Help Box

The bottom of the spreadsheet contains a context sensitive Help Box for the selected field. As you configure channel parameters, the Help box identifies the field and provides pertinent user information. An example, taken from the previous figure, follows.

Example: In the above figure the User Label cell (of channel 1) is selected. The Help box identifies the field as "User-specified channel label" and states user options. In this case, they are (1) to type in a desired label, i.e., to provide the channel with more meaningful name [not to exceed 16 characters]; or (2) keep the default label of P1_CH00.

User Input

To set up channel parameters, first select the appropriate cell (highlighted in a bold box) with the mouse or keyboard arrow keys (up/down/sideways). Some cells allow you to key-in values from a keyboard (values such as user labels, offsets, etc.). When key-in cells are selected, a user-input box will appear where you can type in characters as needed (e.g., channel label in previous figure). Some cells allow you to choose the desired setting from a drop-down list; you select among the options, and the parameter is set. Other cells allow you to set numeric values with "spinner" up/down arrows that change the value incrementally (selecting a point between the spinners changes the mouse action into a virtual scroll bar—as you drag the mouse vertically, the numeric values change accordingly).



User-set parameters can be set individually per channel, or the same value can be "filled down" for an entire column. To apply the same column setting to multiple channels, use the spreadsheet's **fill-down** feature. Select multiple cells in a column by dragging the mouse with the left mouse button (or using the <Shift> and arrow keys). **Enable the fill-down feature with the right mouse button**.

As a shortcut to toggle channel readings on or off, you can place the cursor in the Reading column and double-click the mouse. Another alternative is to double-click the column title, and every channel value in the column will change to the next value if such a value is list-selectable. Globally, you can switch all channel readings in the Indicators menu as Start All Indicators and Stop All Indicators.

For program windows that exhibit an "Apply" button, note that parameter changes will not be *locked-in* until the Apply button has been pressed (clicked).

File Management

LogView uses various types of files for its operation:

- **System**. **`logbook.sys`** is the file that actually operates LogBook. The file must reside on the PC-Card in LogBook in order for the system to power-on and work properly. All PC-Cards used with LogBook need to have the **logbook.sys** file.

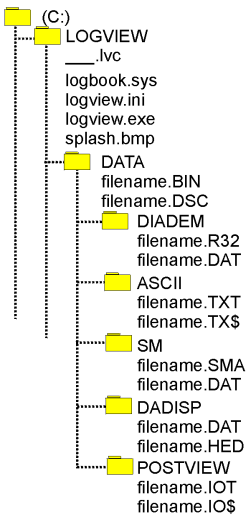
- **Setup (Acquisition Configuration)**. The filename extension for the acquisition setup file is **`.LVC`** (from *LogView* Configuration). This file is downloaded to LogBook's PC-Card. The file contains parameter details for a particular acquisition (as configured in *LogView*). When swapping PC-Cards in a remote LogBook, the new PC-Card should have the same **`.LVC`** file.

- **Data**. Names for the data files use a long format convention as described below. The Preferences window from the View pull-down menu allows you to customize how your data files will be named.

File Organization

As data is uploaded to the PC, *LogView* first uploads the raw data file(s) and then converts them into the formats specified in the Preferences window. The raw binary files are placed in the DATA directory in the path specified during a configuration save. If the configuration was never saved the DATA directory will be created in the *LogView* working directory.

LogView creates a sub-directory within DATA for each file format selected. The figure to the right represents a typical file structure.



Data Filename Generation

Uploading can create one data file or many data files. A simple, completed data collection with one timebase will produce only one data file. More complex conditions will create multiple data files. When these conditions exist, *LogView* creates a *file-set* rather than a single file.

These **configurations** will create multiple data files during an upload.

- With multiple timebases enabled, *LogView* generates a separate file for each rate.
- With Auto Re-arm set greater than 0, multiple trigger blocks will be collected—each in a separate file.

These **events** will generate multiple file-sets.

- When LogBook configuration is re-armed through *LogView* or by cycling LogBook's power, a new file-set is created.
- When a partial upload takes place with an attached LogBook, a new file-set is created.
- When a partial upload takes place from a PC-Card in the PC's socket, a new file-set is created.

A partial upload saves part of the data from an active acquisition. Three ways to perform a partial upload:

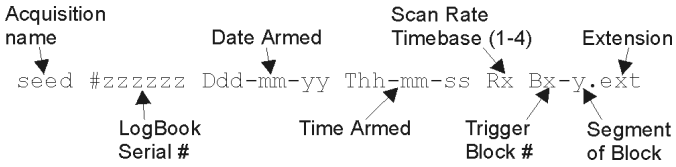
a) During an acquisition, connect your PC to LogBook and execute an upload. To make room for additional data, the uploaded data is deleted from the PC-Card.
b) During an acquisition, swap the PC-Card in LogBook with a different card. Then insert the card into your PC, and perform an upload.
c) Start an upload of any kind; then click Cancel while the upload is taking place.

Naming Format for Data Files

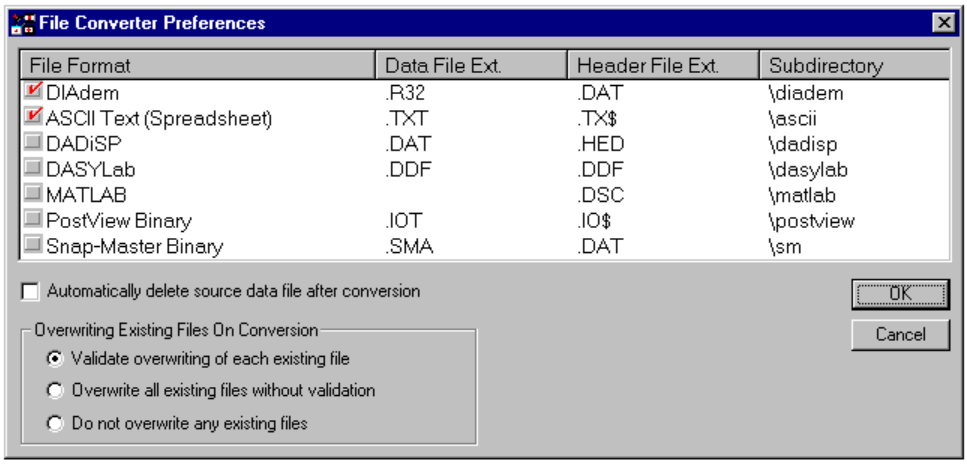
LogView names uploaded data files to make them easy to identify and organize. The File Converter Preferences window (Represented below) allows you to customize *LogView's* naming process to suit your needs. Navigate as follows to access the window: View Pull-down menu ⇒ Preferences ⇒ File Converter. Preferences can be set so:

- Files will not be accidentally overwritten
- The use of several LogBooks is easy to manage.
- Test times and dates automatically embedded
- It is easy to identify files that are part of the same acquisition

The figure and table below define the full-field format for data files. As described in the next section, you may wish to turn off unneeded fields for simplicity.



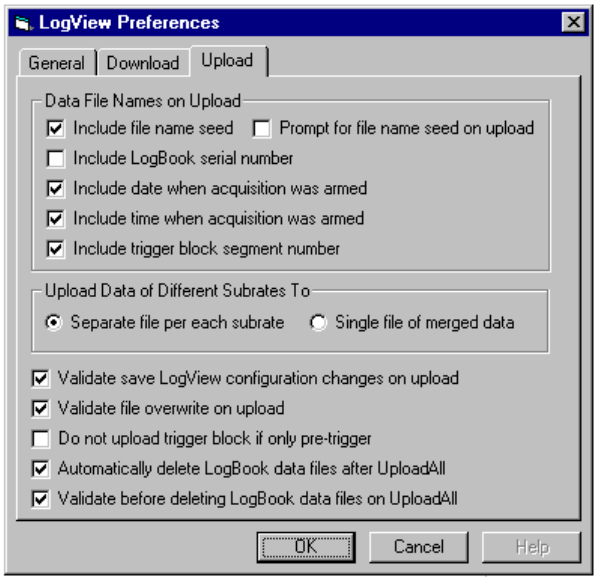
`seed`	User-supplied identifier string (e.g., TOM1) provides easy identification of files associated with a specific test, person, or device-under-test.
`#zzzzzz`	When multiple LogBooks are being used, the 6-digit serial number identifies which LogBook was used to collect the data.
`Ddd-mm-yy`	The Date field represents the date the acquisition was initially armed. This date is not necessarily the date when the data was actually collected. It is possible LogBook was armed on Thursday but did not trigger until Saturday. The file-last-modified date shown as a file attribute in **Windows Explorer** (not **LogView Explorer**) is the date the file was uploaded to the PC.
`Thh-mm-ss`	The Time field represents the time the acquisition was initially armed. This time is not necessarily the time when the data was actually collected. It is possible LogBook was armed at noon but did not trigger until 2:00pm. The file-last-modified time shown as a file attribute in **Windows Explorer** (not **LogView Explorer**) is the date the file was uploaded to the PC.
`Rx`	The Rate field holds a number from 1 to 4 representing the scan rate for the file. If channels are stored at more than one rate, a file is created for each rate.
`Bx-y`	The Block field holds 2 numbers: x is the trigger block number, and y is the segment of the trigger block. A trigger block is segmented when partial uploads take place. Typically, y will be 1 when the entire trigger block is uploaded at once. The numbers are generated chronologically as they occur.
`.ext`	The filename extension for the data files and their explanatory header files (see following figure)



File Converter Preferences Window

This window is reached by navigating as follows: View Pull-down menu ⇒ Preferences ⇒ File Converter

Customizing the File Name



LogView Preferences Window, Upload Tab Selected

This window is reached by navigating as follows:
View Pull-down menu ⇒ Preferences ⇒ Upload Tab

Under certain conditions, all filename fields may not be needed. To turn off fields, simply enable or disable the check boxes in the Upload tab of the Preferences window (see figure here and discussion on page pg.46). Be aware that simplifying the filename removes the safeguards to prevent 2 files having the same name and causing an overwrite/lost information condition. If fields are disabled, overwrites are more likely to occur.

The following table suggests when it is safe to turn off various filename fields.

Condition	Recommendation
I want to overwrite old data every time I perform an upload.	No optional fields are required.
I only have one LogBook.	Turn off LogBook serial number field.
I use a new seed every time I upload.	Only the seed option is needed.
I often accumulate multiple acquisitions on the PC-Card and want to upload them at one time.	Make sure at least the time field is enabled; otherwise, acquisitions will be overwritten as they are uploaded.
I never perform partial uploads.	Don't need block number.

Example of all parameters: LAB1 #123456 D03-15-98 T12-04-12 R1 B1-1

SEED (user description string) = “LAB1”

LogBook serial number = 123456

Date armed = March 15, 1998

Time armed = 12:04:12PM

Rate = 1

Trigger block = 1, Segment = 1

Simplest application. If a new acquisition is uploaded, this file will be overwritten: `R1 B1-1`

Rate = 1

Trigger block = 1, Segment = 1

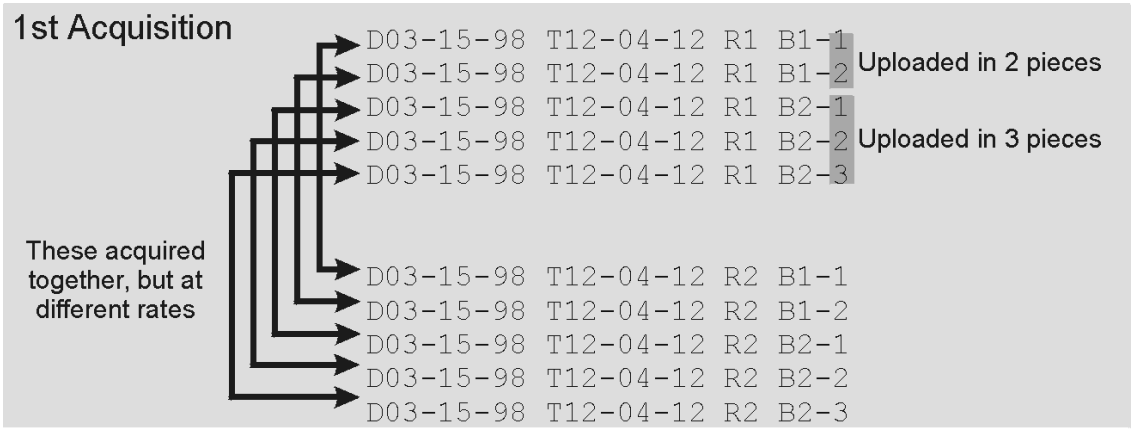
If all acquisitions are performed in the same day, the time can identify the files: `T12-04-12 R1 B1-1`

Time = 12:04:12pm

Rate = 1

Trigger block = 1, Segment = 1

The example below shows data files from an acquisition with 2 trigger blocks and 2 timebases; the acquisition was uploaded in segments. All the dates and times are the same because these trigger blocks are all part of the same acquisition. The first two files represent a continuous data collection—2 files exist because of partial uploads.



Example of Data Uploaded in Segments

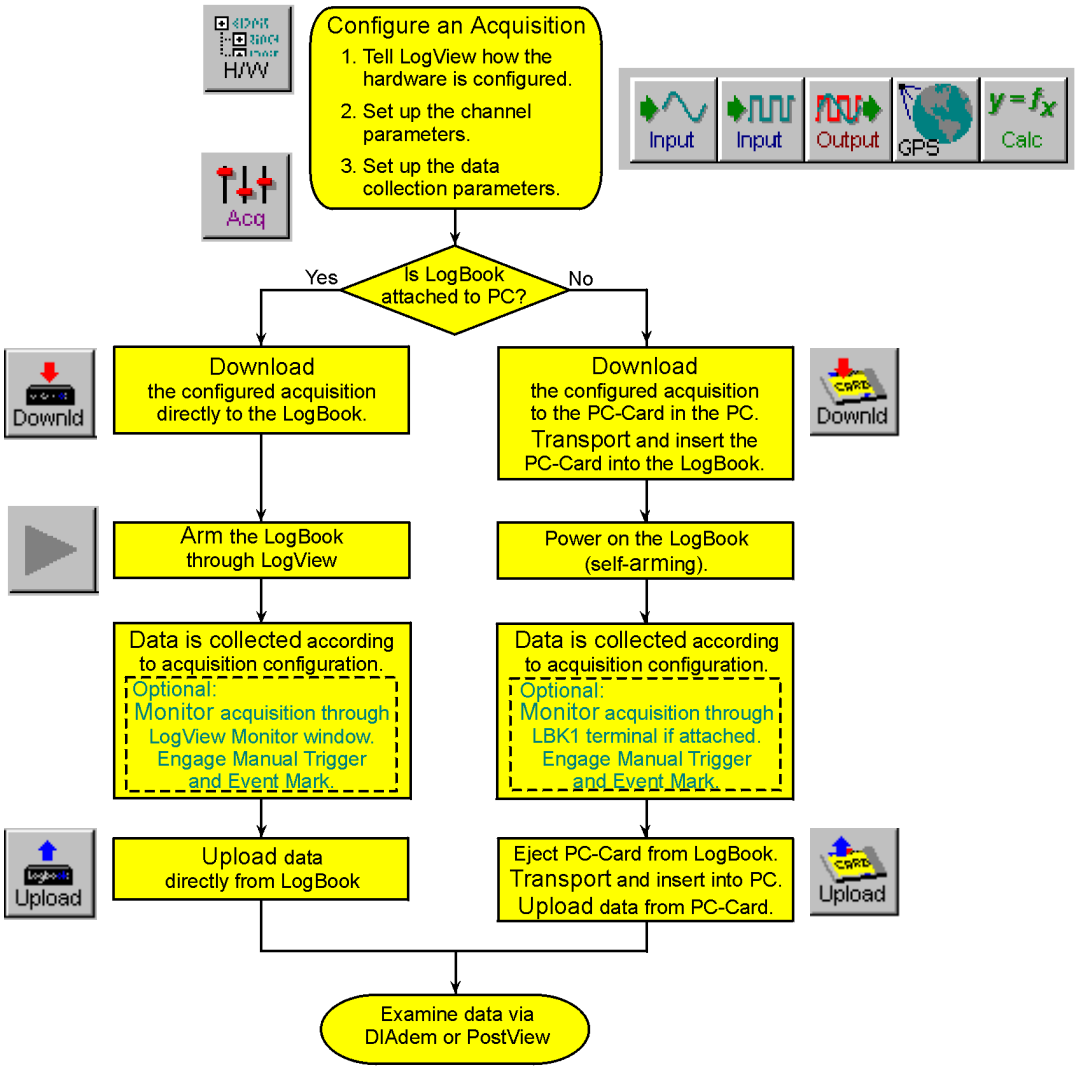
Procedures

Because of *LogView's* flexibility, this manual can not detail every possible use of the system. Instead, these procedures explain how to perform typical tasks. Understanding these tasks will help you apply the principles to a variety of data acquisition environments. For your particular application, you may need to combine or alter these procedures. For more details, you may need to refer to related Menu Descriptions or procedures.

This section begins with a flowchart of a simple acquisition and then explains the following tasks and operational modes:

Flowchart of a Simple Acquisition

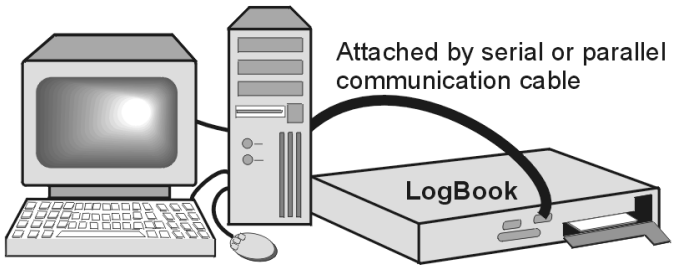
Consider the flowchart of a simple data acquisition. Whether LogBook is attached or unattached, the process is similar except for downloading and uploading. You begin the process in *LogView* by defining the parameters for an acquisition.



Basic Operational Flow of a LogBook Acquisition

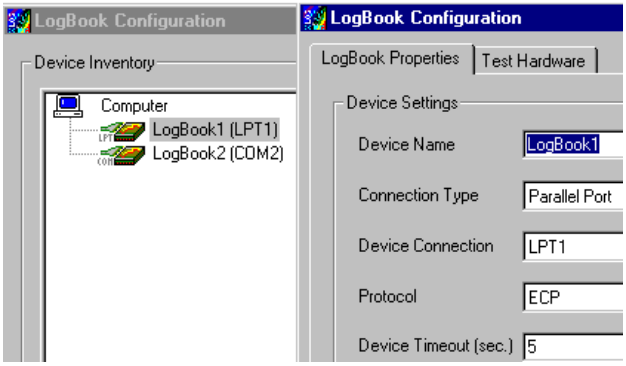
Using an Attached LogBook

When using an attached LogBook, *LogView* communicates directly to the PC-Card in LogBook through the communication interface (serial or parallel).



After *LogView* recognizes the attached LogBook, an acquisition setup file can be downloaded to LogBook. After the acquisition, data can be uploaded from LogBook without handling the PC-Card.
Note that steps 1 through 4 are often done during the initial installation.

1. On your PC with *LogView* already loaded, open control panel applet, and check Hardware Configuration. If no LogBook is present in the tree, click Add Device and a LogBook ID; otherwise, select a LogBook in the tree and click Properties.
2. Under LogBook Properties tab, enter or verify device name, the connection type, the protocol, a timeout duration; and then click Apply.
3. (if serial connection) Under Port Settings tab, select baud rate and related parameters; and then click Apply.
4. Verify proper LogBook connection and power-on; then, under the Test Hardware tab after, click the Test button. Testing will verify system parameters and then bench-mark system communication performance.



5. Launch *LogView* from your PC (unless you set up a shortcut, you can find *LogView* in the Programs group in the Start menu). The control window and the Analog Input Channel Configuration window should appear.
6. Under the Device menu in the control window, click Select LogBook. From the drop down list, select LogBook you just configured in the hardware tree; then click the Attach icon to establish a communications link. The Upload and DownLoad buttons in the Control Window should now be enabled (*LogView* recognizes when LogBook is attached and enables the applicable tools as seen by their lettering turning from gray to black).

7. In *LogView's* Analog Input Channel Configuration (see page pg. 31) and Acquisition Configuration (see page pg. 43) windows, set up the channels and trigger parameters you wish to use (see *Simple Data Logging,* page pg. 15).
8. Download the acquisition setup file just configured to LogBook
9. Click the Arm Acquisition button (►). LogBook is now armed and ready to collect data when the trigger parameter is satisfied.
10. During the acquisition, you can monitor system status via LogBook Monitor window accessed from the Device pull-down menu. To verify proper operation, such monitoring is recommended for the first run of a new acquisition setup file.
11. After collecting data, click Upload to pull the data into the PC (see page pg. 26). Depending on the communication channel and size of data files, uploads take a variable amount of time. Uploads can also be done incrementally during an acquisition.

The next time you launch *LogView*, it will automatically look for the selected LogBook and attempt to attach itself. At this point, *LogView* and LogBook will be in constant communication. If you want to turn off LogBook's power or detach the communication cable, you should first select Break from the Device menu or Exit from the File menu.

PC-Cards purchased with LogBook have been initialized at the factory. PC-Cards purchased elsewhere must be initialized through *LogView*. The initialization procedure is discussed in the following paragraph.

Initializing a PC-Card

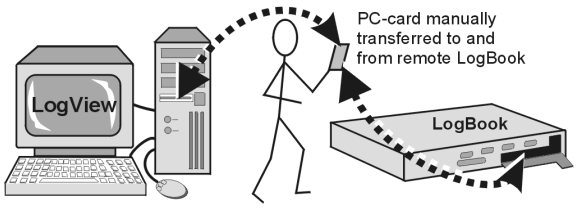
PC-Cards, that were purchased with LogBook, have been initialized. **PC-Cards purchased elsewhere must be initialized.** Initialization is accomplished as follows:

1. Place the PC-Card in the PC's corresponding socket.
2. Select the driver according to your card's documentation.
3. In *LogView*, under the Device menu, click Select PC-Card, then click OK.

LogView will check the card and initialize it as needed.

Using LogBook "Unattached"

When using a LogBook "unattached," *LogView* does not communicate in real time with LogBook; instead, *LogView* downloads the acquisition setup file to a local PC-Card that can later be manually transferred to LogBook.



After the acquisition is complete, the PC-Card that collected data in LogBook must be manually transferred to the PC where *LogView* can then upload the data. The PC-Card must first be properly initialized :

1. Take any ATA PC-Card memory device, and insert it into a corresponding socket on the PC. If this is the 1st time this type of card has been inserted, Windows may require driver information. Follow the on-screen instructions, or refer to the documentation included with the PC-Card.
2. Launch *LogView* from your PC (unless you set up a shortcut, you can find *LogView* in the Programs group in the Start menu). The control window and the Analog Input Channel Configuration window should appear.
3. Under the Device menu, click Select PC-Card. Use the drop down list to tell *LogView* which drive letter is associated with the PC-Card. Note: as PC-Cards are inserted and removed from the sockets, Windows will arbitrarily assign drive letters. If 2 PC-Cards occupy 2 sockets, the order of their insertion usually dictates the assignment of drive letters. The Attach, Upload, and Download buttons on the Control Window should now be enabled.

4. In *LogView's* Analog Input Channel Configuration and Acquisition Configuration windows, set up the channels and trigger parameters you wish to use (see *Simple Data Logging* below).
5. Download the acquisition setup file (**`logbook.sys`** will also be downloaded if not already present).
6. Eject (remove) the PC-Card from the PC socket, and transport it to the remote LogBook site. Insert the PC-Card into LogBook's socket, and power up LogBook. LogBook will automatically load the setup file and arm the system.
7. After the remote LogBook has collected all the data, remove the PC-Card from LogBook's socket, transport it to the PC, and insert it into the PC's socket. If *LogView* is running, it will soon recognize the presence of the card and enable the Upload and Download buttons.
8. Click Upload to pull the data into the PC.

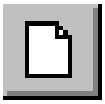
After telling *LogView* which drive letters are associated with PC-Card disks, *LogView* will periodically poll the system for their presence. As cards are inserted and ejected, *LogView* will automatically enable and disable the Upload and Download buttons.

If a large quantity of data will be recorded, you should return to the remote LogBook in time to swap PC-Cards [before the first card is full]. Card swapping is discussed in the introduction chapter of the user's manual. All PC-Cards to be swapped must first be initialized as discussed in the previous section.

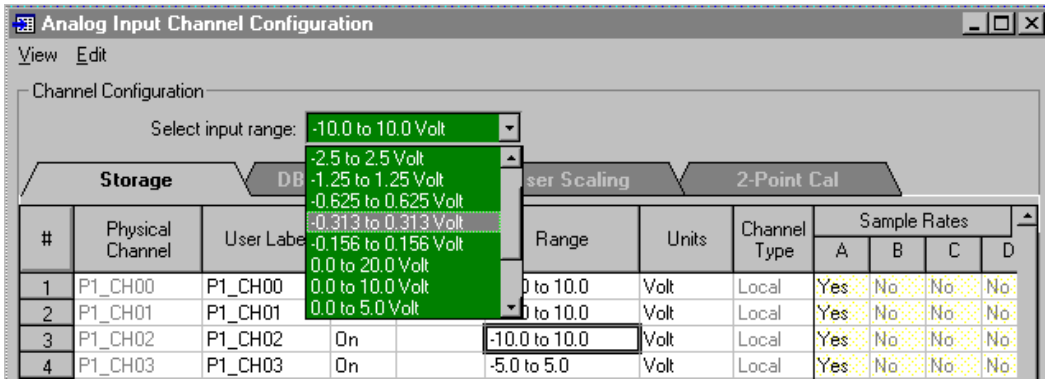
Simple Data Logging

To log data, you need to configure the hardware, set up the channels, and configure the acquisition parameters. The following steps are generic and will vary with different applications.

1. Launch *LogView*, and Attach *LogView* to your Logbook if working in an attached mode or to a PC-Card inserted in your PC if working in a remote, unattached mode (see previous 2 procedures if necessary).
2. Select New under the File menu or the "New" button, and give the acquisition setup file a name relevant to your application.



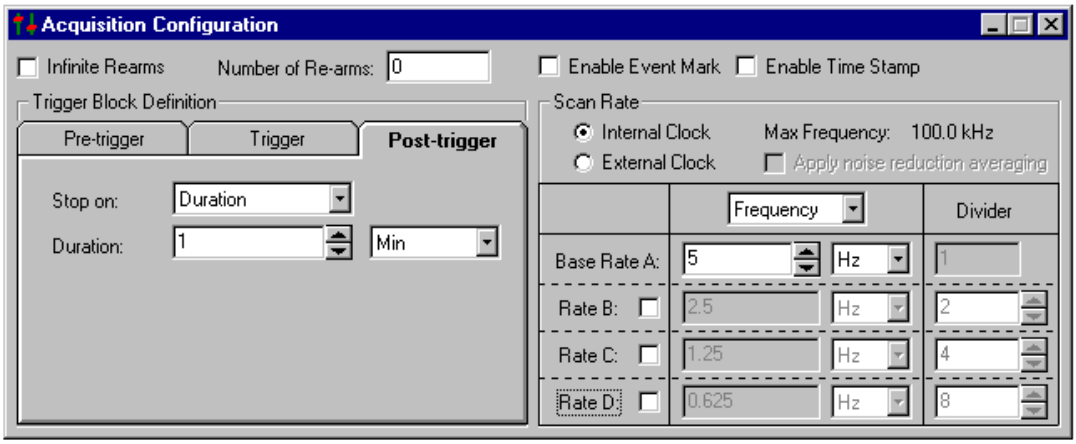
3. Click the Analog Input button to display the setup grid in the Analog Input Channel Configuration window. Turn all but the 1st 4 channels off (or as applicable) by placing the cursor in the On/Off column and double-clicking to toggle the setting on and off (unused channels that are left ON will limit the maximum scan rate possible). To change the Range for a particular channel, click the cursor on the affected and then use the drop down user input box to select an appropriate range (can be bipolar or unipolar).



Selecting Input Range for Channel P1-CH02

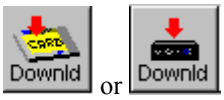
4. Click the Digital Input button. Turn all the digital channels "Off"—or "On" as applicable.
5. Click the Acquisition Configuration button or select that submenu from the View pull-down menu, and the Acquisition Configuration window will appear.

6. From the Acquisition Configuration window, select all the parameters that define your desired acquisition. Under the Trigger tab, select Immediate as the trigger if you want to start the acquisition the moment the system is armed. Under the Post Trigger tab, select a duration of 1 minute. In the Scan Rate frame, set Base Rate A to 5 Hz (or as applicable) by typing in a value and selecting the proper unit.



Acquisition Configuration Window

7. After verifying that all settings are as you desire, select Save under the File menu and associate a name to your acquisition setup file (if not already done so).
8. From the main toolbar, click the Download button to send the setup file to LogBook's PC-Card.



9. To arm an attached LogBook, click the Arm button.
10. To arm a remote LogBook, eject the PC-Card, transport it to LogBook, insert it into LogBook's socket, and then apply power.
11. To upload data from an attached LogBook during an acquisition or after the acquisition is complete, click the Upload button.

or

12. To upload data from a remote LogBook after the acquisition is complete or as part of card swapping, eject the PC-Card from LogBook and transport to the PC's socket; then click the Upload button.

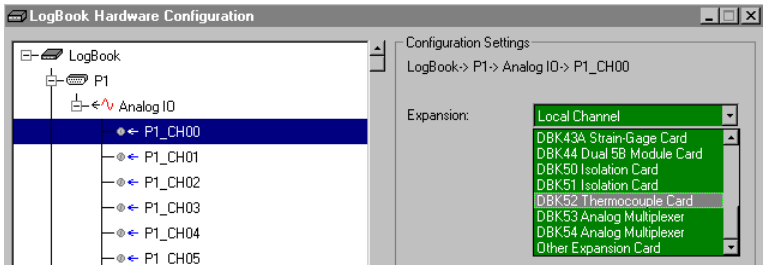
13. To inspect the data, click the View Data button. This will activate a "view" program, if installed.

Setting Up DBK Cards

DBK cards and modules provide channel expansion and signal conditioning. For proper operation, you must use *LogView* for software configuration of the DBK cards. All hardware configuration-related parameters can be found in the *LogBook Hardware Configuration Window* (sometimes referred to as a "hardware tree").

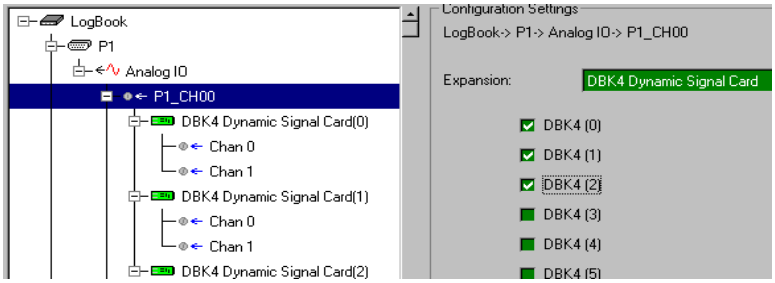
Reference Note: The *DBK Option Cards and Modules User's Manual* (p/n 457-0905) contains parameter definitions and information as to which parameters are set in hardware and which are set in software.

1. Open the *LogBook Hardware Configuration Window* by clicking the Hardware Configuration button.
2. To add analog input DBKs, select P1 Analog I/O in the tree, and set its property to Single-ended. Digital DBKs use P2 port and are set up in a similar way.
3. Select a channel and assign it either a local channel or a specific DBK expansion module that will multiplex several channels into the same main channel. See following figure.



Setting Analog I/O Channel P1_CH00, DBK52 T/C Card Selected

4. Most DBKs have related cards and sub-channels as part of their method to multiplex up to 16 channels into each main channel. Click the appropriate checkboxes to set up the channels; and then OK to accept these settings. See following figure.



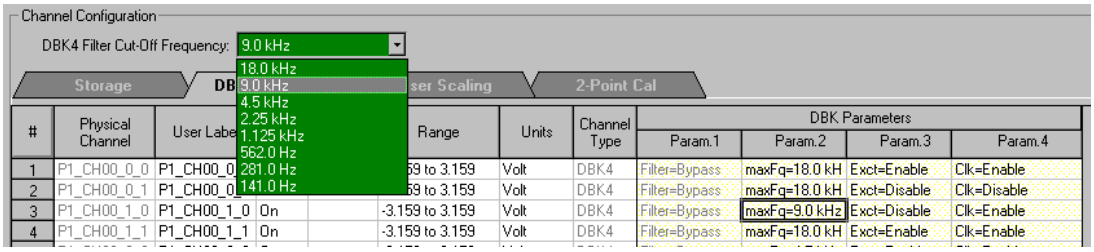
Selecting Applicable DBK4 Dynamic Signal Cards

5. Click the Analog Input button to view the newly setup channels in the Analog Input Channel Configuration spreadsheet (see page 31). Verify all channel numbers and assign user labels as desired.

Note: In some cases, such as with DBK19, channel values are returned in units of temperature, instead of volts.

6. From the *Analog Input Channel Configuration window*, select the DBK Parameters tab to view specific settings for each DBK channel. Set the DBK parameters at this time. If necessary, refer to the appropriate section of the DBK Option Cards and Modules User's Manual for an explanation of the parameters; for example, DBK4 programmable filter values and DBK7 debouncing times.

You can resize the *Analog Input Channel Configuration window* by dragging its right edge further to the right. This allows you to see up to four parameters for each channel.



Setting DBK Parameters in the Analog Input Channel Configuration Window

When configuring DBKs, the *LogBook Hardware Configuration Window* provides a means of setting up all manual hardware settings. Once configured, the analog and digital channel setup spreadsheets provide a means of setting up channel-specific, programmable features.

Some DBKs have hardware settings that must be manually set inside the DBK, such as jumpers or DIP switches. In these cases the parameter setting in *LogView* must match the actual hardware. Setting one does not automatically set the other; in other words, you must make configuration settings in both software and hardware, when applicable.

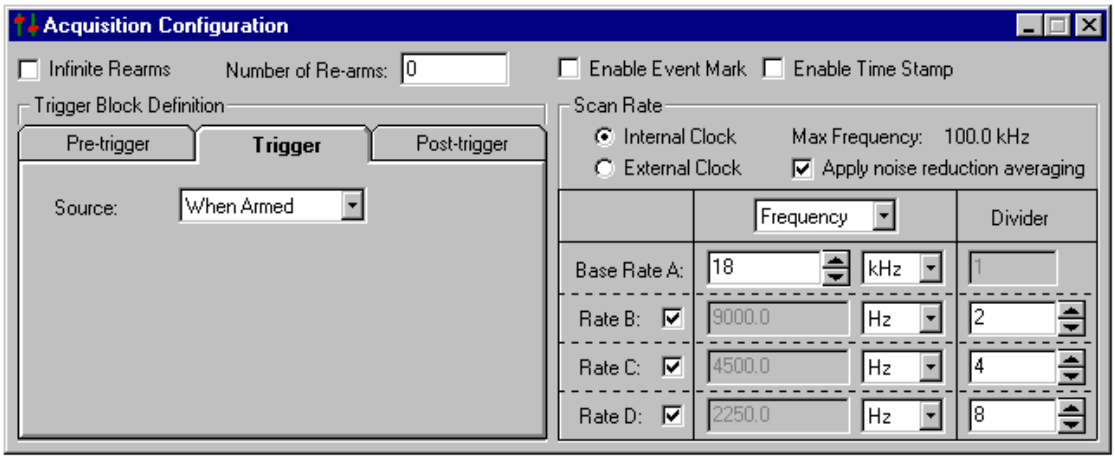
For specific DBK hardware configuration refer to the appropriate section of the DBK Option Cards & Modules User's Manuals (p/n 457-0905).

Using Multiple Timebases

LogBook is capable of storing channels at 4 independent timebases (one base rate and 3 rates that are divisions of the base rate). Two reasons for using multiple timebases are: first, to reduce the amount of storage required by saving slow channels at a slow rate—acquisition can last longer before filling up the PC-Card; and second, to provide noise reduction by averaging and thus enhance the value of the data.

1. Open the Acquisition Configuration window (see page pg. 43) by clicking the Acquisition Configuration button.

2. In the scan rate frame at the right of the window, set the Base Rate A to the maximum frequency required for any channel.

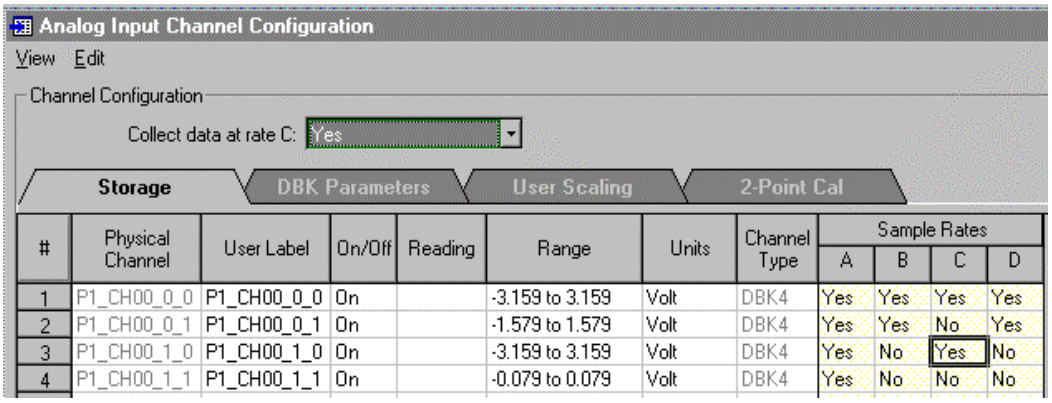


Acquisition Configuration Window

3. Check all three rate checkboxes B, C, D. Type in a divider for rates B through D to create sub-rate sampling frequencies which are based on Base Rate A. *LogView* will compute and display the corresponding rates in frequency or period units.

Note: The higher the divider (right most column) the slower the scan rate.

4. To reduce noise in sensitive channels like thermocouples, these channels can be sampled at a high rate but stored at a slower rate after mathematically averaging the intermediate values. By checking the Apply Noise Reduction Averaging checkbox, channels stored at a sub-rate will store the average of all of the values collected at the Base Rate A. Extraneous values that are obvious errors will have less effect on the data—it's also possible to set up a calculated channel that only accepts values within a defined range.
5. Close the *Acquisition Configuration Window.*
6. Click the Analog Input button to display the Analog Input Channel Configuration window. Under the Storage tab, note that the newly configured sample rates are enabled. The sample rate columns determine the rate at which each channel's data will be stored. Each enabled (On) channel can have data stored at sample rates A, B, C, D (or a combination, there of), see following figure.



#	Physical Channel	User Label	On/Off	Reading	Range	Units	Channel Type	Sample Rates A	B	C	D
1	P1_CH00_0_0	P1_CH00_0_0	On		-3.159 to 3.159	Volt	DBK4	Yes	Yes	Yes	Yes
2	P1_CH00_0_1	P1_CH00_0_1	On		-1.579 to 1.579	Volt	DBK4	Yes	Yes	No	Yes
3	P1_CH00_1_0	P1_CH00_1_0	On		-3.159 to 3.159	Volt	DBK4	Yes	No	Yes	No
4	P1_CH00_1_1	P1_CH00_1_1	On		-0.079 to 0.079	Volt	DBK4	Yes	No	No	No

Setting Sample Rates for Data Storage. Each enabled channel can be assigned up to four rates.

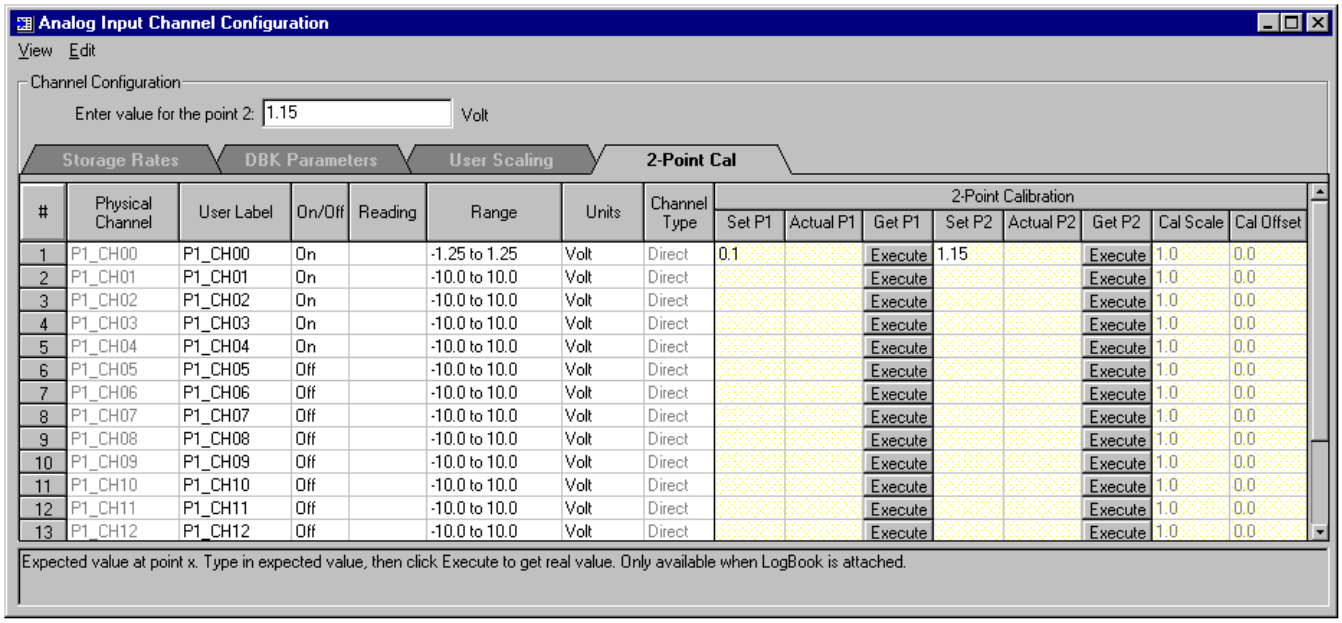
7. Set the cells in these four columns to **Yes** or **No**, as desired, for all enabled (On) channels. Channels shown as "Off" are not sampled.
8. Once configured, download the acquisition setup file, and initiate data collection.

Using Digital 2-Point Calibration

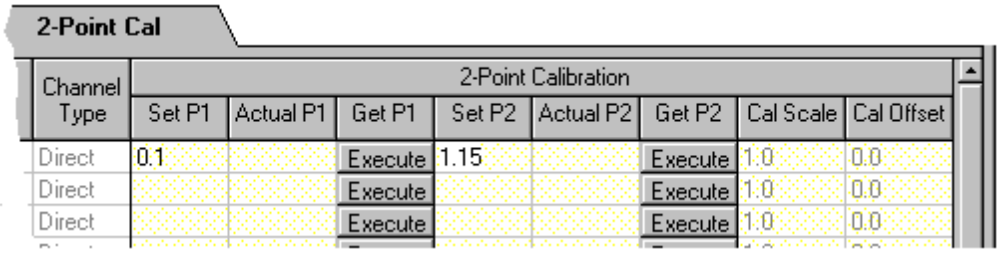
Remote LogBooks can not be calibrated. 2-point calibration can only be performed when LogBook is attached to the PC via a communication interface.

2-point calibration allows you to mathematically "trim out" inaccuracies in the measurement equipment and/or the transducer. By allowing the equipment to measure 2 known points in the measurement range, LogBook can calculate linear constants (the scale and offset) to correct inaccuracies in its analog inputs (see page pg. 33). For channels where only one known point can be applied and verified, *LogView* provides offset trimming.

1. Click the **Attach** button to establish communication with LogBook.
2. Click the **Analog Input** button to open the analog input spreadsheet.
3. Click the 2-Point Calibration tab to expose the calibration columns. If some columns are obscured, scroll to the right to reveal them or resize the window by dragging the right edge further to the right. Note that the default **Cal Scale** and **Cal Offset** [mathematically applied to each channel] are 1 and 0, respectively (right-most columns).



Analog Input Channel Configuration, 2-Point Cal Tab Selected

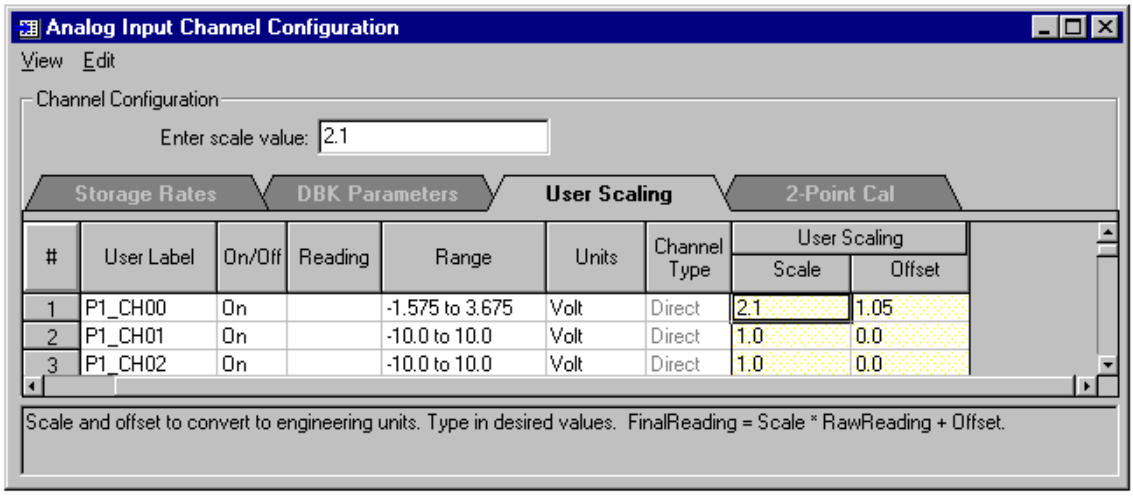


2-Point Cal Tab, Partial Close-up

4. Apply a voltage to channel 1 near the bottom end of the measurement range.
5. Type the known value into the **Set P1** column for the associated channel.
6. Click the Execute button under the **Get P1** heading. This allows you to read the channel and calculate the required offset. Note that the channel value read is now shown in the **Actual P1** column and the **Cal Offset** column now shows the correction factor.
7. Apply a voltage to channel 1 near the top of the measurement range.
8. Type the known value into the **Set P2** column for the associated channel.
9. Click the Execute button under the **Get P2** heading to read the channel and calculate the required offset and scale. Note that the channel value is now shown in the **Actual P2** column. The **Cal Offset** and **Cal Scale** columns now show the correction factors.

For channels using thermocouples, it may be impractical to provide more than one calibration point. In such cases, apply just one known point in Set P1, and click the corresponding Execute button. This will adjust the offset only, which is typically the source of most transducer error.

For strain gages, use the User Scaling tab to enter the transducers' transfer functions (e.g., volts to pounds), then use 2-point calibration to periodically trim the scale and offset. This eliminates the need to manually adjust sensors using hardware potentiometers.

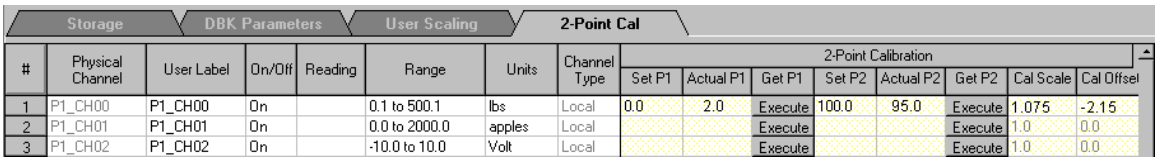


User Scaling. **Final Reading = Scale*RawReading + Offset**

An Example of Using LogView for 2-Point Calibration

Once the trimpots have been physically adjusted during initial installation, periodic trimming can be performed through LogView's 2-Point software calibration. The LogView procedure does not require the use of trimpots and should not be confused with the 2-point method in which trimpots are mechanically calibrated as discussed in the DBK16 section of the DBK Option Cards and Modules User's Manual.

During the LogView software procedure, 1 or 2 loads are read and compared with expected values. The software automatically calculates and applies the necessary correction factors.



The above figure shows the columns in the **2-Point Calibration** tab. To fine tune the accuracy of the value coming from a linear sensor, LogView provides both 1- and 2-point calibration.

- **One-point calibration** can be used to zero a channel, such as a thermocouple channel, which is usually more accurate in scale than offset. One example of one-point calibration is that of placing a thermocouple in an ice bath and setting the 0°C point, and no other.
- **2-point calibration** determines the scale and offset factors to convert the raw readings into accurate calibrated readings. Two points of known (set) values must be compared with two actual sensor readings.

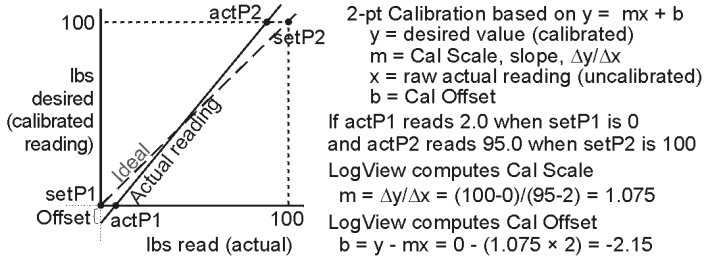
An example of 2-Point Calibration (via LogView Software).

To calibrate a strain-gage scale:

1. Unload the scale.
2. Enter a value of 0.0 into the *Set P1 column*.
3. Click the *Get P1 Execute button*. This lets you read the actual sensor value (2.0 in the example).
4. Place a 100 lb. weight on the scale.
5. Enter a value of 100 into the *Set P2 column*.
6. Click the Get P2 Execute button. This lets you read the actual sensor value (95.0 in the example).

LogView automatically computes the **Cal Offset** factor (near 0) and **Cal Scale** factor (near 1).

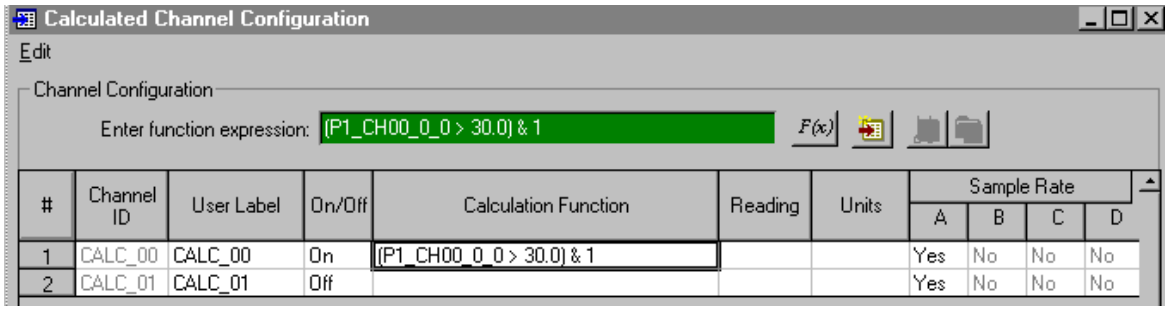
From this point on, LogView automatically applies the **y = mx + b** equation to the incoming reading, resulting in a calibrated reading.



Using Digital Outputs As Alarms

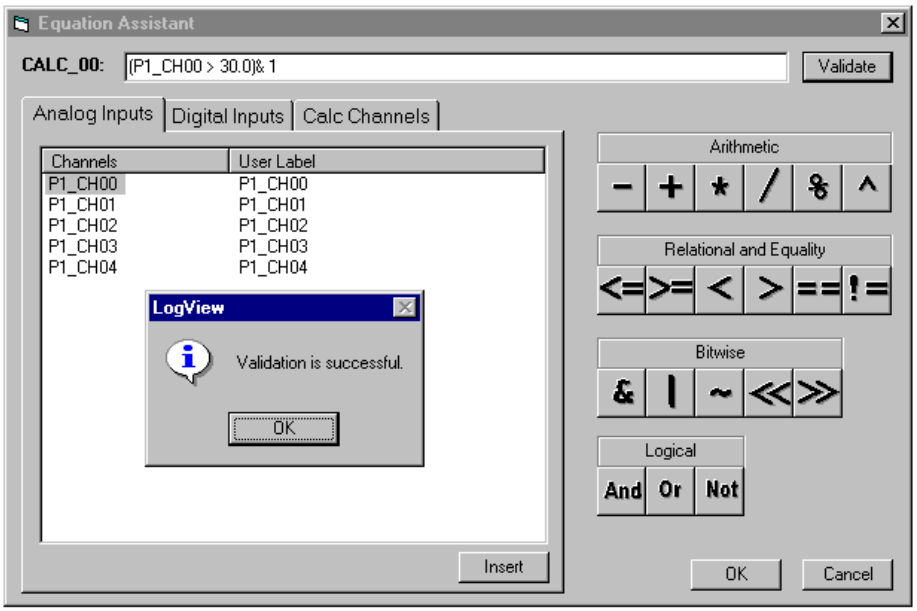
Using *LogView's* calculated channel capability (see page pg. 37), digital outputs can be stimulated by events such as signal levels in analog inputs (e.g., to sound an alarm at a rising temperature before a test system over heats).

1. Click the Analog Input button to activate the *Analog Input Channel Configuration window*.
2. Turn on the analog input channel that you'd like to use to stimulate a digital output channel.
3. Click the Calculated Channel button to open the Calculated Channel Configuration window.
4. Click the Add New Channel button (located just right of the *F(x)* button); or select "Add New Channel" from the Edit pull-down menu to activate the first or next calculated channel.
5. In the Calculated Function column, type in the following equation "(P1_CH00 > 30.0) & 1". If you're not using channel 0, replace P1_CH00 with your channel tag. This equation will yield a 1 in its least significant bit when the value of channel 0 is above 30, and 0 when it is below 30.



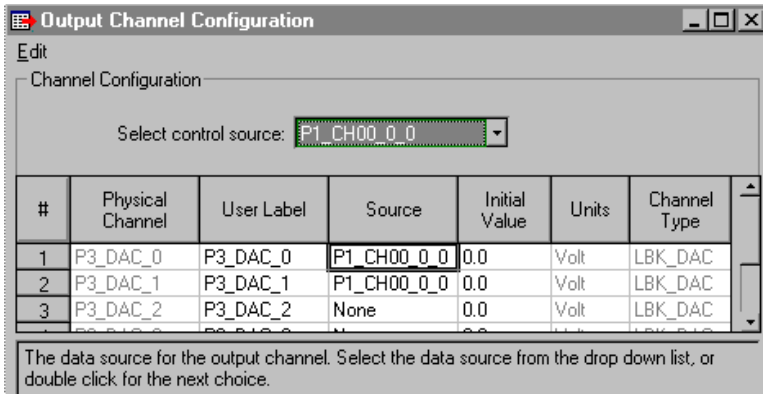
Entering an Equation (Function Expression)

To verify accurate use of syntax, use the Equation Assistant *F(x)* and the Validate button (see following figure). The Equation Assistant is accessed via the *F(x)* button. Refer to page pg. 38 for detailed information regarding the Equation Assistant.



The Equation Assistant can be used to create and validate equations.

6. In the Calculated Channel setup grid, set the newly configured channel to "On."
7. Close the Calculated Channel grid.
8. Click the Output I/O Setup button. If no digital output rows are present, click the Hardware Configuration button in the main toolbar and add a few digital I/O ports as outputs; e.g., the LBK2 DAC on the P3 port.



Selecting a Control Source

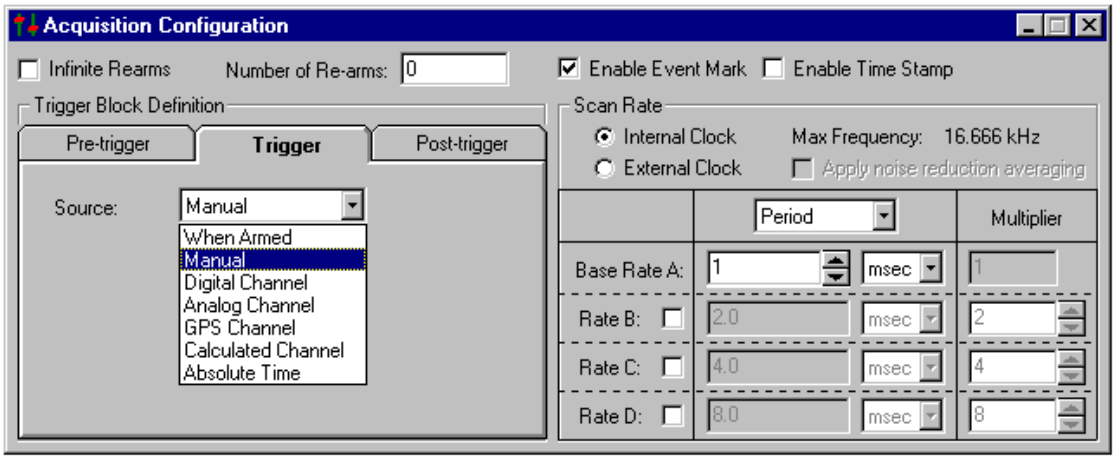
9. Select an output port; then set its Source to the calculated channel that we just configured. Unless you changed the label in the Calculated Channel grid, the source will be CALC_00.
10. Once configured, download the configuration to initiate data collection with the specified alarm output.

Using Exception Capturing

LogView can be set up to wait for defined events to occur, then capture data until another specified event. The triggering process is controlled through the Acquisition Configuration window (see page pg. 43). If Auto Re-arm is used, LogBook will then re-arm itself after each triggering sequence, waiting for the occurrence of the next trigger event. This setup allows LogBook to capture specific events rather than a continuous data stream that may be useless in some applications. Exception capturing is useful where continuous data would soon fill up the PC-Card with low-value data.

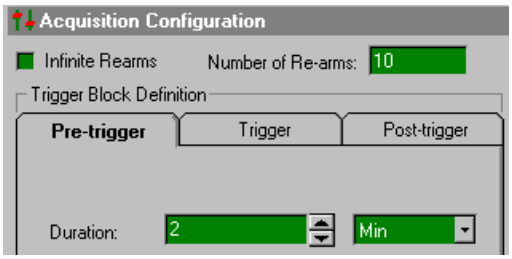
1. Click the Acquisition Configuration button to open the Acquisition Configuration window.
2. Set up the trigger parameter as required. The trigger can be set to various parameters including the level of an analog input channel where you can select a threshold and hysteresis with rising or falling edge. Trigger sources include analog input level, digital channel, immediate, absolute time, and manual Event Mark.

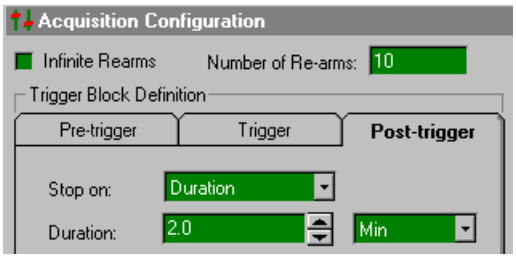
In the manual mode, you must select the Enable Event Mart checkbox so that the Event Mark buttons on LogBook Monitor window and on the LBK1 are activated.



Setting Up the Trigger Parameter

3. In the Pre-trigger tab, set up a duration of time occurring before the trigger event that you would like to save data for. Exception capturing is most effective when you can set trigger parameters to isolate the particular data of interest (e.g., all data 2 minutes before and after a specific event).
4. In the Post-trigger tab, you can set the stop event based on a duration, an analog or digital event, or a manual Event Mark.





5. Enable auto Re-arm by setting the field to 10.
6. Set up input channels as needed in the Analog Input Channel Configuration window.
7. Save the setup file, download it to the PC-Card, and start the acquisition.
8. After the data has been acquired, upload the data files from the PC-Card with *LogView's* Explorer or Upload button. Note that individual trigger blocks for each capture have indexed file names, with each name being unique.

Reference Note: The *File Management* section of this document module, page 8, contains detailed information regarding filename structure.

Menu Descriptions

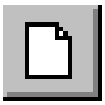
The rest of the document module describes each menu in detail, including all the related windows and parameters. The menus are presented in the order they appear in the control window and can be referred to as needed.

File Menu

New
Open
Save
Save As
Download
Upload
Download As
Configuration Report
About LogView
Authorization
Exit

The File menu helps manage your data and configuration files. You can determine the file format, as well as how and where the files are saved in memory. As stated in the previous reference note, The *File Management* section of this document module, beginning on page 8, contains detailed information regarding filename structure.

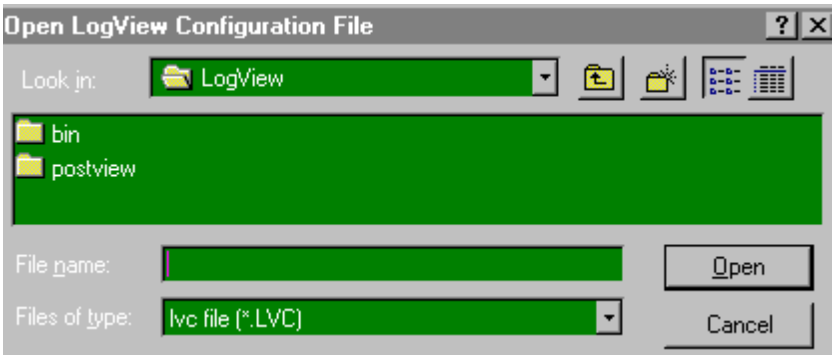
New



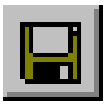
The New command allows you to create a new file. If you try to leave a configuration not yet saved, dialog box asks how "Do you want to save the current configuration?"; select Yes, No, or Cancel. The Save/Save As window will appear. Several icons in the top right of the window offer you help in navigating through files and levels of folders.

Open

The Open command allows you open a previously created configuration file.



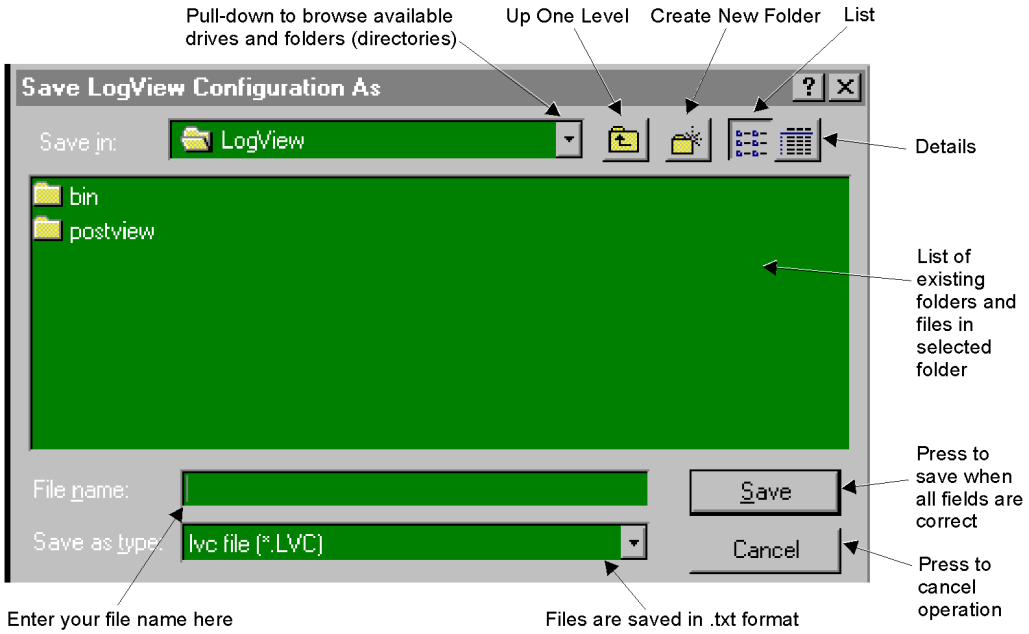
Save



The **Save** command allows you to store the configuration file you are currently working on.
The **Save As** command uses the same window as the Save command and allows you to enter a new file name. The current file remains unchanged from its last save.

Save As

(no toolbar icon)



Upload

or

The Upload command uses *LogView's* Explorer to get data files from a PC-Card. The PC-Card can reside in LogBook if LogBook is attached to the PC or in the PC's card slot if the PC-Card was manually transferred from a remote LogBook.

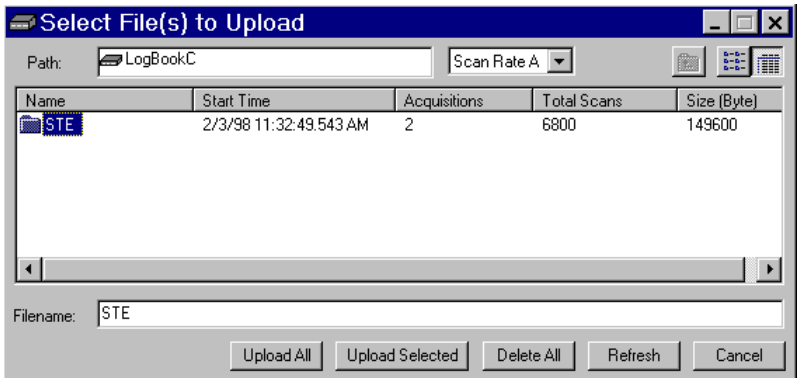
Note: The Upload icon and the Explorer item in the Device menu can upload from both LogBook or the PC's card slot; in either case, the icon looks slightly different as shown at left.

When the Upload button is clicked:

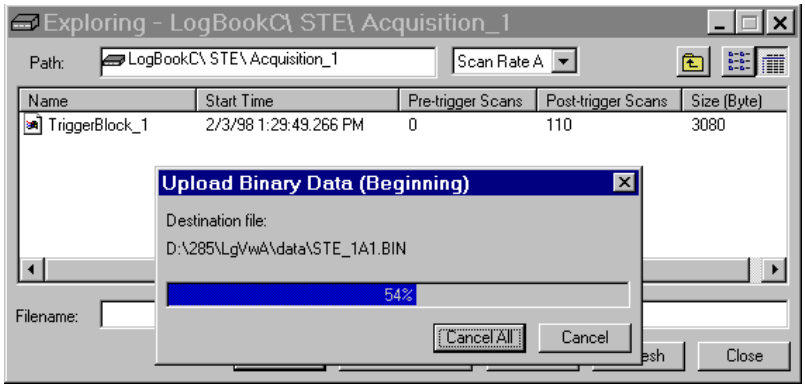
- If only 1 acquisition file (inactive) resides on the PC-Card, all that data is uploaded to the PC's hard drive.
- If more than 1 acquisition file resides on the PC-Card, an exploring window will appear and allow you to select which acquisition files or trigger blocks you may wish to upload.
- (attached mode only) If the only acquisition file on the PC-Card is active, all acquired data will be uploaded. To prevent duplication of records and conserve storage space, data already uploaded is then deleted from the PC-Card.

The buttons at the bottom of the window (see following figure) allow you to:

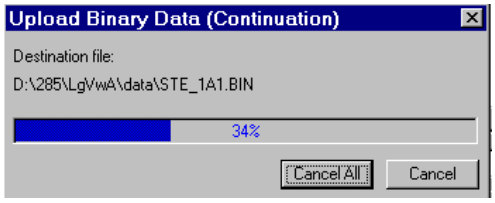
- **Upload All** the files on the PC-Card to your PC's hard drive with the designated Path and delete data on the PC-Card if "Delete on Upload All" is selected in *LogView* Preferences. **Note**: with attached mode and an active acquisition, this is the only way to upload data.
- **Upload Selected** uploads only those files which you select.
- **Delete All** the files on the PC-Card.
- **Refresh** will refresh Explorer with data from an active acquisition.
- **Cancel** will close the dialog box.



If uploading an active file for the first time (using Upload All), the following window appears (here, **Cancel** will stop an upload in progress):



If uploading an active file that is already partially uploaded, the following window will appear:



Download

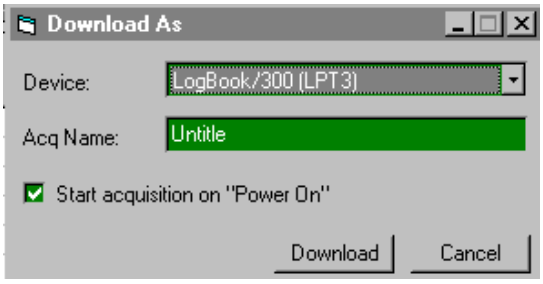
or

The Download command downloads the current *LogView* setup to LogBook if attached (or a PC-Card if LogBook is unattached) with the same name as the *LogView* setup name. If the current setup is default-named "Untitle", a dialog box asks "Enter the acquisition name before *LogView* will download current configuration". Select OK to save, Cancel to stop download process.

Download As…

(no toolbar icon)

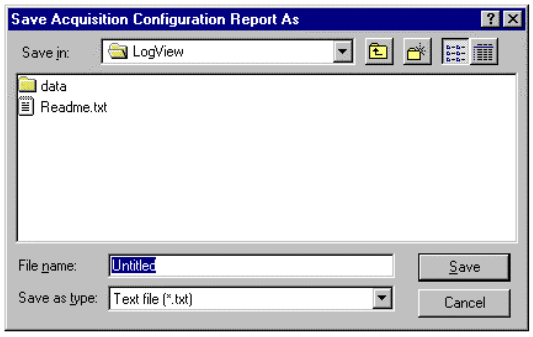
The Download As… command works much like a Save As command and brings up the window shown at left. You can choose your own file name. When fields contain the correct data, select the Download button; or you may Cancel the operation.



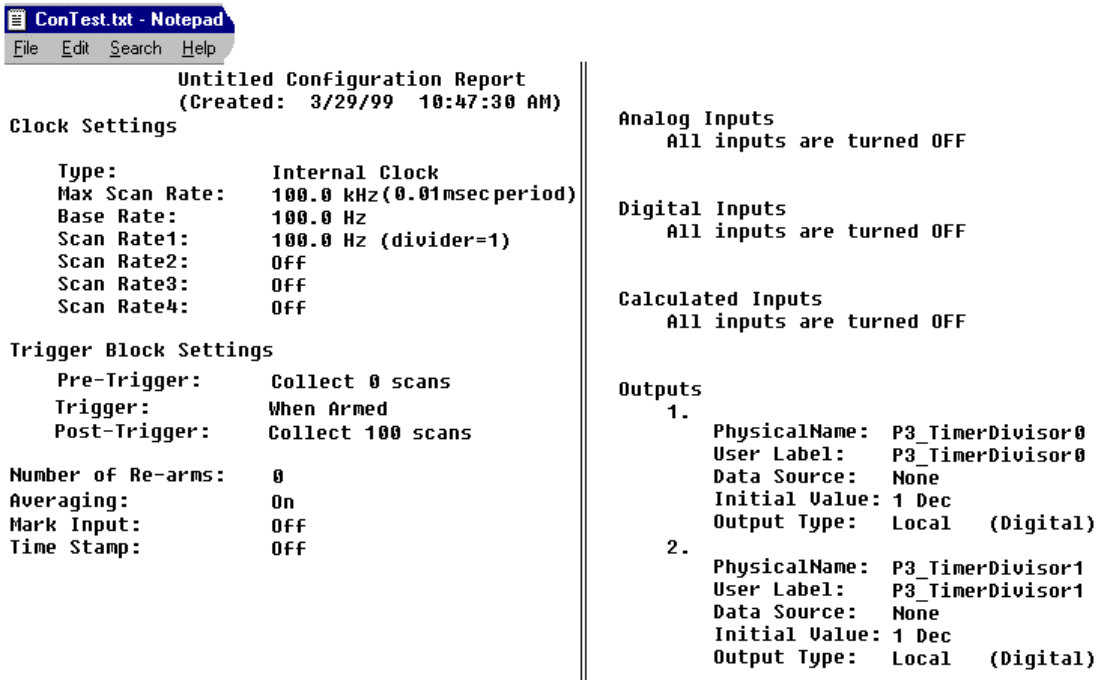
The checkbox Start acquisition on "Power On" is default-checked so that a remote LogBook will begin an acquisition as soon as it is turned on. You can uncheck this box if you will be using an LBK1 to arm the acquisition or if you will be applying power to LogBook but not wanting to begin an acquisition immediately.

Configuration Report

Configuration Report allows you to save a report of the configuration parameters. An example follows.



Configuration Report Window (selected from File Pull-down Menu)



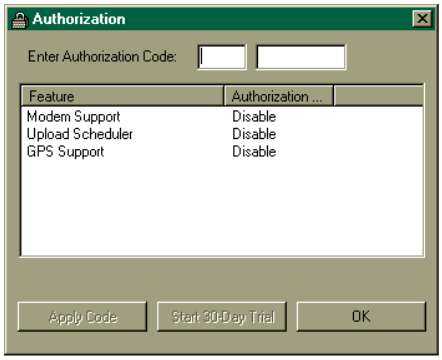
Sample Configuration Report (Condensed Image)

About LogView

Provides the software version number and a statement regarding copyright violations.

Authorization

The File Pull-Down menu includes an *Authorization* dialog box. If you have one or more of the following options: Modem Support, Upload Scheduler, or GPS Support, you must enter an appropriate authorization code to enable the applicable feature. If you do not have an authorization code you can obtain one from your service representative, or can enable the features for a 30-day trial period. It is possible for a code to authorize one, two, or three features, depending on how the options were ordered, for example, all three ordered during initial purchase or ordered separately over a period of time.



Authorization Dialog Box

Exit

The Exit command closes *LogView*. *LogView* can also be closed by selecting the "X" button at the top right of the Control Window. If entered data has not been downloaded (saved), a dialog box will appear with such a message.

View Menu

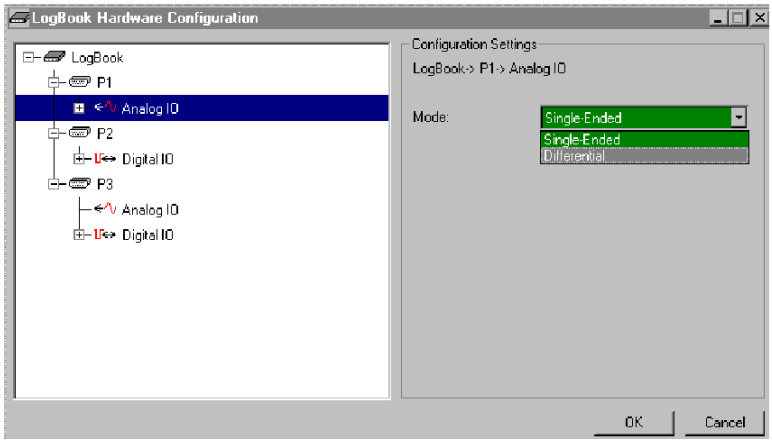
Hardware Configuration
Analog Input Channels
Digital Input Channels
Output Channels
GPS/Serial Input Channels
Calculated Channels
Acquisition Configuration
Preferences

The View menu includes configuration windows, most of them in the spreadsheet format. Descriptions of the View pull-down menu's selections follow.

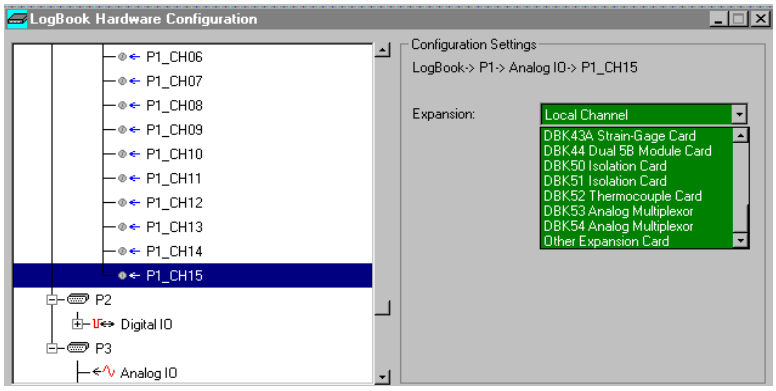
Hardware Configuration

Selecting Hardware Configuration brings up the windows shown below. As you progress through the hardware tree, the window will prompt you for related information as needed. All 3 I/O ports (P1, P2, P3) are set up here.

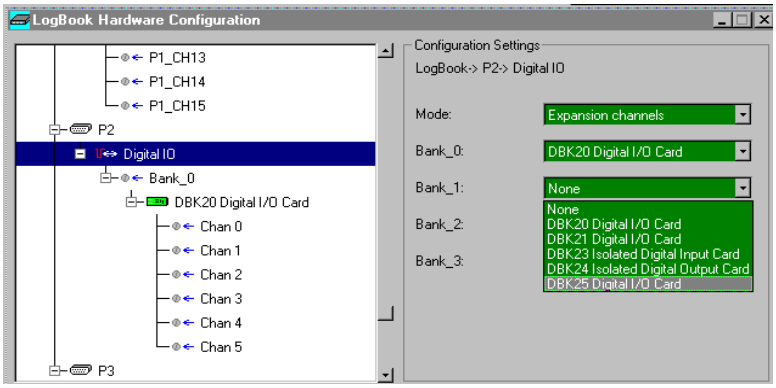
Note: these windows only set up non-programmable parameters to match corresponding hardware settings. *LogView* cannot know these settings unless you enter them here. Some DBKs have programmable settings that must be set under the DBK Parameters tab of the Analog Input Channel Configuration window.



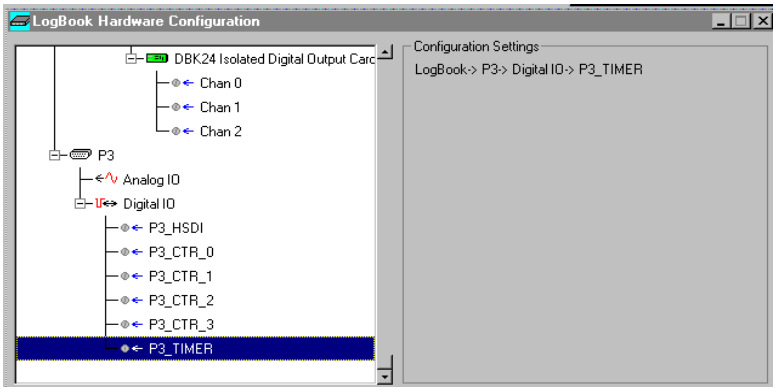
This figure shows user selecting the differential mode of analog input on P1.



This figure shows user selecting a particular DBK to be attached to channel 15 of P1.



This figure shows user selecting a particular DBK as assigned to 1 of 4 banks of channels on P2.

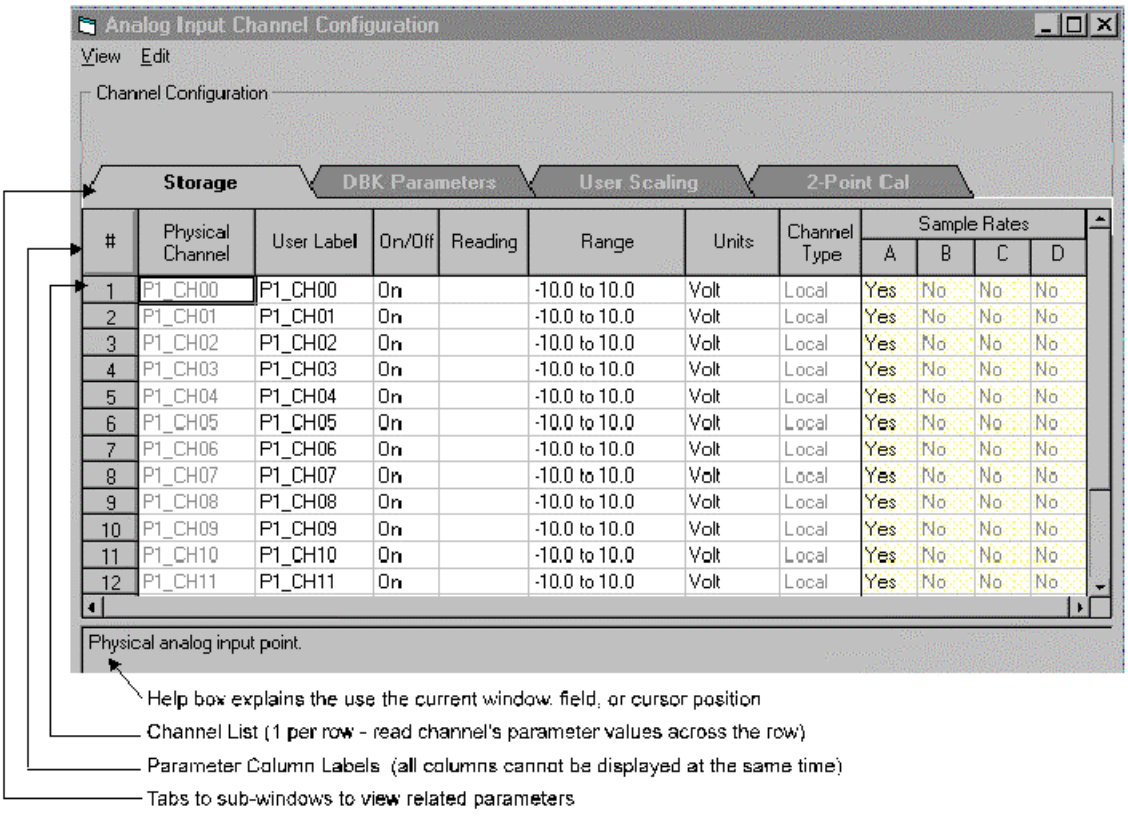


This figure shows user selecting LogBook's timer on P3's Digital I/O line.

Analog Input Channel Configuration

The analog input spreadsheet (see following figure) uses four tabs to group analog input parameters. Always visible are the Physical Channel, User Label, On/Off, real-time Reading, Range, Units, and Channel Type columns. Clicking a tab exposes one of the four sub-windows of parameters including Storage, DBK Parameters, User Scaling, or 2-Point Calibration.

If beneficial, adjust column width by placing the cursor on the line between columns (in the column header) and drag the line left or right as needed, for example, to enter a more descriptive user label.



In the **User Label** column, use the default channel labels or insert your own labels of up to 16 characters (the column width is flexible). Labels are saved with the data so more meaningful channel names will appear in your post acquisition display-and-analysis software. For example, a calculated channel that controls an alarm can be so named; several channels that are combined for a calculated channel can be so named, etc.

When possible, use User Label names that closely resemble the Physical Channel names. This practice makes channel identification easier to remember and helps avoid confusion.

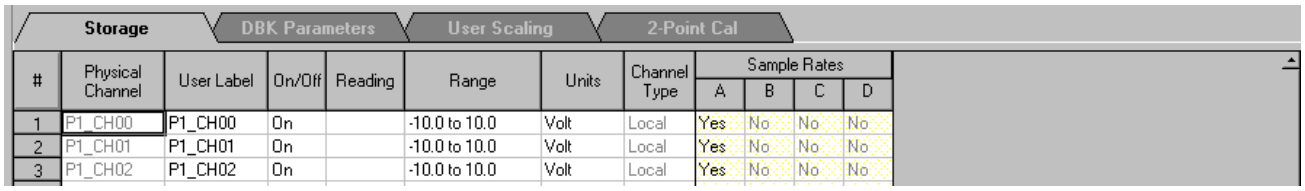
***Example*: If Physical Channel P1_CH01 was being used for an alarm, a User Label of P101Alarm would be logical.**

In the **On/Off** column, use On to enable or Off to disable channels. System performance for the enabled channels is improved by disabling (not sampling) the channels not in use.

The **Reading** column displays the real-time channel value in the user's units. The immediate feedback by this column allows you to optimize range settings, verify scaling, or validate sensor calibration.

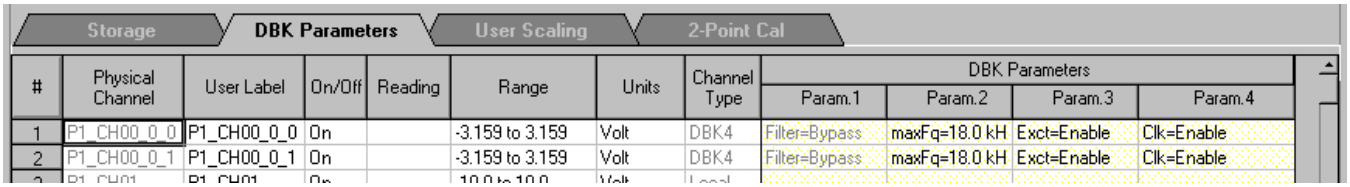
For the **Range** column, all LogBook channels and most DBK cards have a programmable gain amplifier (PGA) that provides multiple ranges. Adjusting the range allows you to zoom in or out on your signal for maximum signal resolution for the range needed. If the **Units** and/or **Scale** (from the User Scaling tab) are changed, the available ranges are presented in terms of the new units. For example, if a user scaling of ×20 is applied to a channel to convert volts to PSI (pounds per square inch), the available range choices for that LogBook channel would be ±200 PSI, ±100 PSI, ±50 PSI, 0-400 PSI, 0-200 PSI, etc.

The next figure shows the columns accessible with the **Storage** tab selected (default). If channels are sampled only to derive calculated channels or stimulate outputs, they do not need to be stored. For example, a channel can be sampled at a high rate to prevent aliasing while a calculated channel is used to derive and save its maximum every 10 seconds. In this case, only one sample every 10 seconds is saved, rather than thousands. The **Sample Rates** columns in read-only mode are set up in the Acquisition Configuration dialog box where up to 4 timebases can be defined. For applications with slow and fast signals, slow signals can be sampled at a slower rate, optimizing the system's storage capacity. The base rate A can be divided by 3 divisors for rates B, C, and D (see page pg. 44).



#	Physical Channel	User Label	On/Off	Reading	Range	Units	Channel Type	Sample Rates A	B	C	D
1	P1_CH00	P1_CH00	On		-10.0 to 10.0	Volt	Local	Yes	No	No	No
2	P1_CH01	P1_CH01	On		-10.0 to 10.0	Volt	Local	Yes	No	No	No
3	P1_CH02	P1_CH02	On		-10.0 to 10.0	Volt	Local	Yes	No	No	No

Analog Input Channel Configuration, Storage Tab Selected

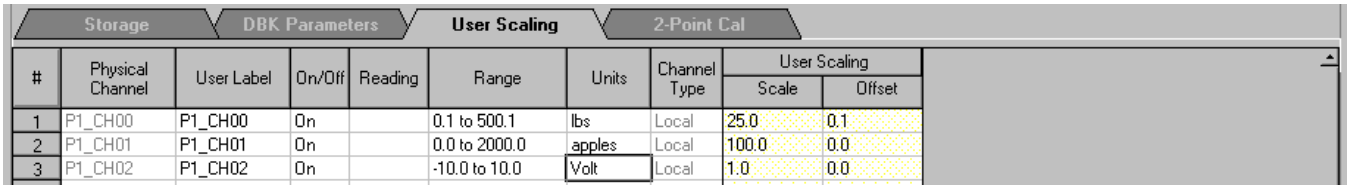


#	Physical Channel	User Label	On/Off	Reading	Range	Units	Channel Type	DBK Parameters Param.1	Param.2	Param.3	Param.4
1	P1_CH00_0_0	P1_CH00_0_0	On		-3.159 to 3.159	Volt	DBK4	Filter=Bypass	maxFq=18.0 kH	Exct=Enable	Clk=Enable
2	P1_CH00_0_1	P1_CH00_0_1	On		-3.159 to 3.159	Volt	DBK4	Filter=Bypass	maxFq=18.0 kH	Exct=Enable	Clk=Enable

Analog Input Channel Configuration, DBK Parameters Tab Selected

The above figure shows the **DBK Parameters** tab used to configure channels with programmable DBK parameters. Depending on the DBK, values must be entered in the **Param.1** to **Param.4** columns. One such example is the DBK4 that requires filter settings; some other DBK cards also have programmable parameters.

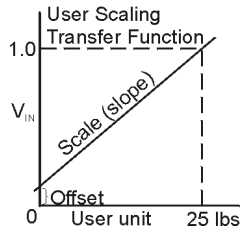
Some DBKs have hardware switches and jumpers for configuration. When using such DBKs, corresponding parameters must be set in the *LogBook Hardware Configuration window.*



#	Physical Channel	User Label	On/Off	Reading	Range	Units	Channel Type	User Scaling Scale	Offset
1	P1_CH00	P1_CH00	On		0.1 to 500.1	lbs	Local	25.0	0.1
2	P1_CH01	P1_CH01	On		0.0 to 2000.0	apples	Local	100.0	0.0
3	P1_CH02	P1_CH02	On		-10.0 to 10.0	Volt	Local	1.0	0.0

Analog Input Channel Configuration, User Scaling Tab Selected

The **User Scaling** tab shown above has **Scale** and **Offset** columns. In User Scaling, you create a **transfer function** so *LogView* will display units that are useful for your application. Here, you can arbitrarily define your **Units** (apples, oranges, whatever) based on the raw input value, typically Volts. To do so, type your new unit name in the Units column and select an appropriate range (e.g. unipolar). Then, enter its linear scale relation to the Volt (e.g. 25 pounds per Volt) and any offset from 0 (e.g. the empty basket measures 0.1 V). The reading and range columns change accordingly.



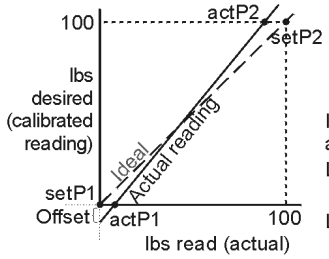
Storage | DBK Parameters | User Scaling | **2-Point Cal**

#	Physical Channel	User Label	On/Off	Reading	Range	Units	Channel Type	2-Point Calibration							
								Set P1	Actual P1	Get P1	Set P2	Actual P2	Get P2	Cal Scale	Cal Offset
1	P1_CH00	P1_CH00	On		0.1 to 500.1	lbs	Local	0.0	2.0	Execute	100.0	95.0	Execute	1.075	-2.15
2	P1_CH01	P1_CH01	On		0.0 to 2000.0	apples	Local			Execute			Execute	1.0	0.0
3	P1_CH02	P1_CH02	On		-10.0 to 10.0	Volt	Local			Execute			Execute	1.0	0.0

Analog Input Channel Configuration, 2-Point Cal Tab Selected

Calibration. The above figure shows the columns in the **2-Point Calibration** tab. To fine tune the accuracy of the value coming from a linear sensor, *LogView* provides both 1- and 2-point calibration. **One-point calibration** can be used to zero a channel—as in a thermocouple, which is usually more accurate in scale than offset. You might place the thermocouple in an ice bath and set just the 0°C point. **2-point calibration** determines the scale and offset factors to convert the raw readings into accurate calibrated readings. 2 points of known (set) values must be compared with 2 sensor (actual) readings.

For example, to calibrate a strain-gage scale, unload the scale, type 0.0 into the Set P1 column, then click the Get P1 Execute button to read the actual sensor value (2.0). Place a known 100 lb weight on the scale; type 100 into the Set P2 column; then click the Get P2 Execute button to read the actual sensor value (95.0). *LogView* automatically computes the **Cal Offset** factor (near 0) and **Cal Scale** factor (near 1). From now on, *LogView* automatically applies the y = mx + b calculation to the incoming reading to produce the calibrated reading.

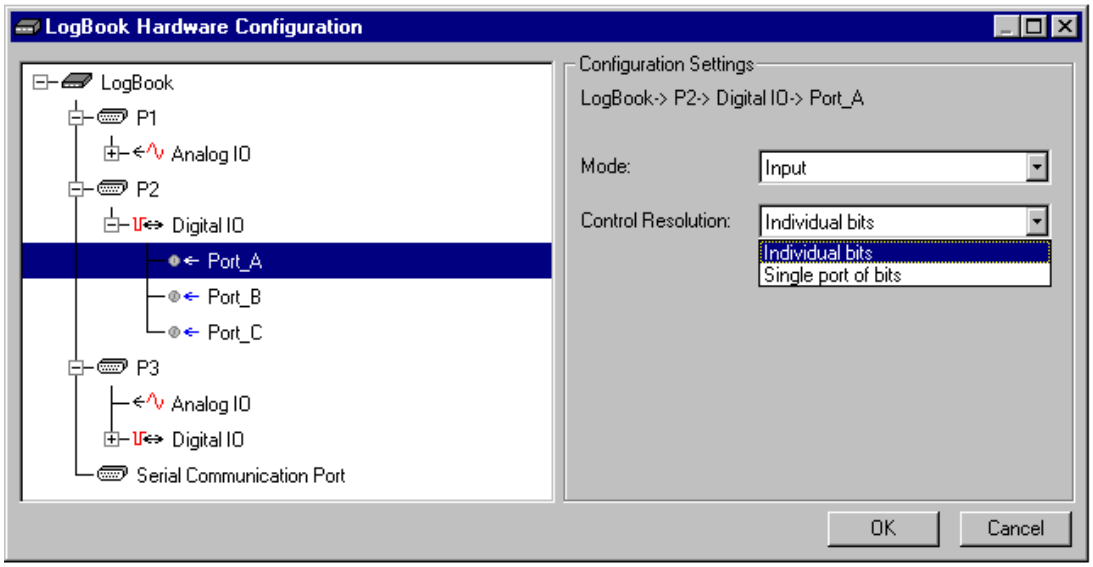


2-pt Calibration based on y = mx + b
y = desired value (calibrated)
m = Cal Scale, slope, $\Delta y/\Delta x$
x = raw actual reading (uncalibrated)
b = Cal Offset

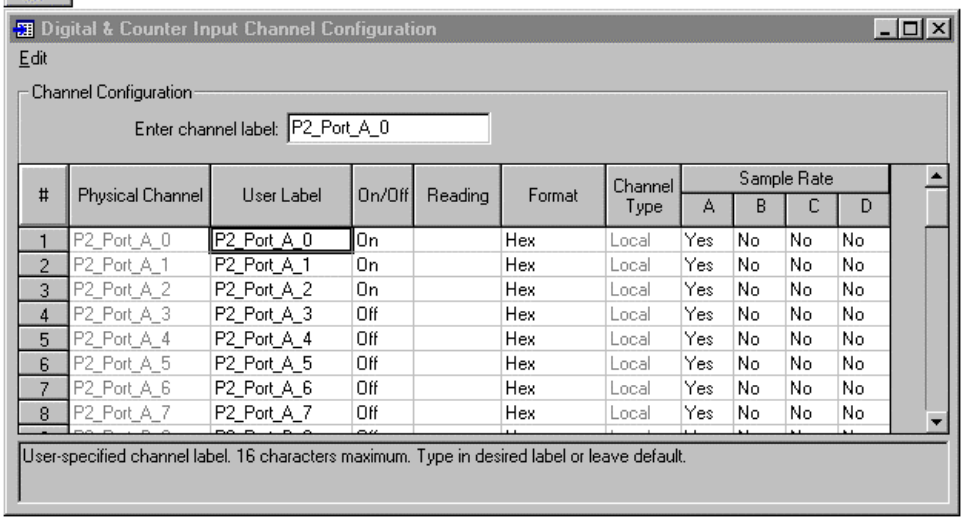
If actP1 reads 2.0 when setP1 is 0
and actP2 reads 95.0 when setP2 is 100
LogView computes Cal Scale
$m = \Delta y/\Delta x = (100-0)/(95-2) = 1.075$
LogView computes Cal Offset
$b = y - mx = 0 - (1.075 \times 2) = -2.15$

Digital and Counter Input Channel Configuration

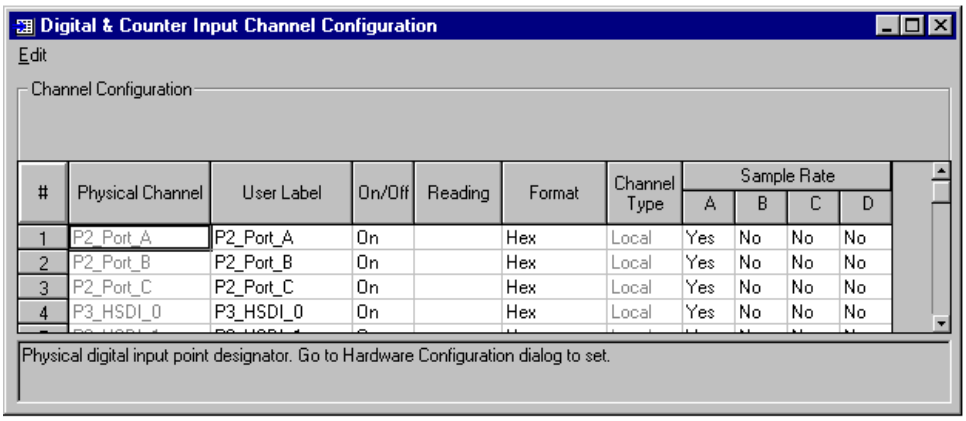
The basic LogBook system has three 8-bit digital ports and one high speed 16-bit port configurable as inputs or outputs in the *LogBook Hardware Configuration window* (see following figure). When configured as inputs, these ports appear in the Digital and Counter Input Channel Configuration spreadsheet. Also, four pulse-input ports can count pulses for summing and/or frequency measurement. Adding digital expansion cards provides up to 192 digital bits.



Configuring Digital I/O Port A as Input, and with Control Resolution as Individual Bits



Digital & Counter Input Channel Configuration Screen, Channels Configured for Individual Bits



Digital & Counter Input Channel Configuration, Each Channel as a Port of Bits

The **Physical Channel** column identifies the actual hardware port of the physical channel.

In the **User Label** column, you can use the default channel names or type in a more suitable label up to 32 characters in length. These labels are saved with the collected data.

The **On** column can enable (On) or disable (Off) individual channels. To maximize system performance, only channels that are enabled are sampled.

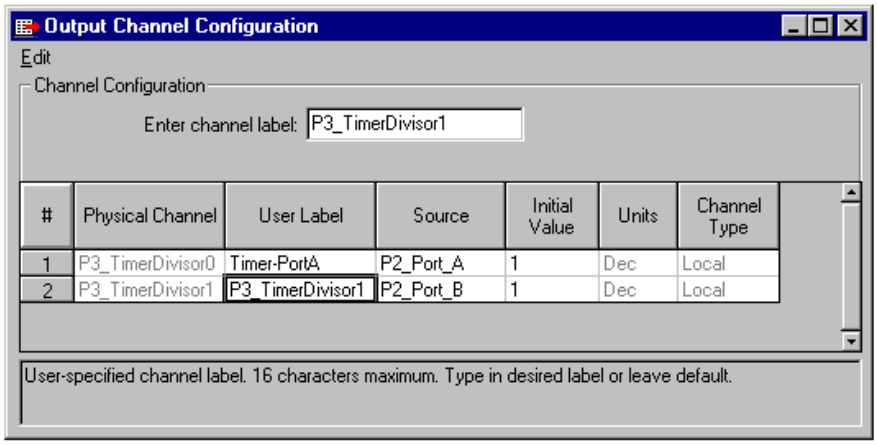
The **Reading** column displays the read-time value of the digital port in the format specified in the **Format** column.

Analog, digital, and pulse samples are all sampled together in LogBook. This makes time correlation possible. In the Acquisition Configuration dialog box, up to four timebases can be specified. A digital or pulse channel can be sampled at any or all of these timebases.

Channels sampled only to derive calculated channels, or to simulate outputs do not need to be stored.

Output Channels Configuration

The Output spreadsheet shows all of the currently available digital and analog output channels. Each output channel requires a source channel to feed it. Source channels can be chosen from an analog input for an analog output for from a digital input for a digital output.



Output Channel Configuration Window

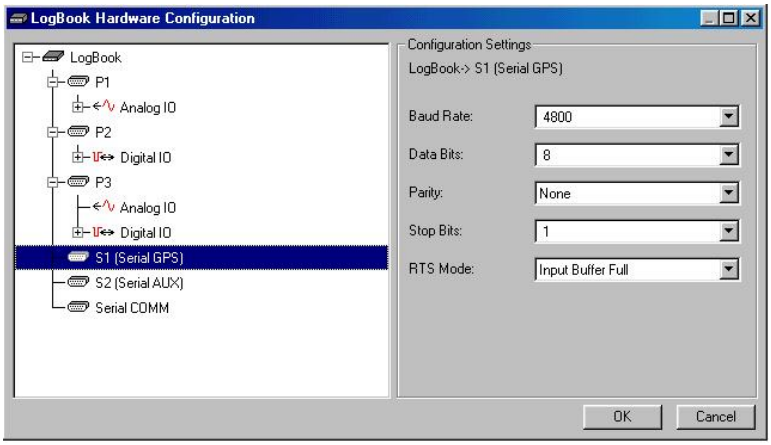
The (physical) **Channel** column identifies the hardware channel assignment.
The **User Label** column allows you to enter a more suitable channel name of up to 32 characters.
The **Source** column designates the input or calculated channel used as the source of data for this output channel. An entry of None disables the output channels.
The **Initial Value** column allows you to initialize the output to a specified value.
The **Units** column indicates units for Initial Value. This column can not be edited. The default is Decimal.

Serial / GPS Channels (*LogBook/360 Only*)

LogBook/360 can store latitude, longitude, and altitude coordinates along with the analog and digital data from the attached transducers, providing it is connected to a Global Positioning System (GPS) receiver. *LogView* software provides an easy method for setting up the GPS channels. No programming, character string parsing, or protocol decoding is necessary.

LogBook/360 can provide direct support for any GPS receiver that conforms to the NMEA 0183 protocol standard. **GPS support is not provided for LogBook/300**.

GPS receivers must be purchased separately, and are available from a variety of sources. If purchasing a GPS make sure it conforms to the NMEA 0183 protocol standard.



LogBook Hardware Configuration

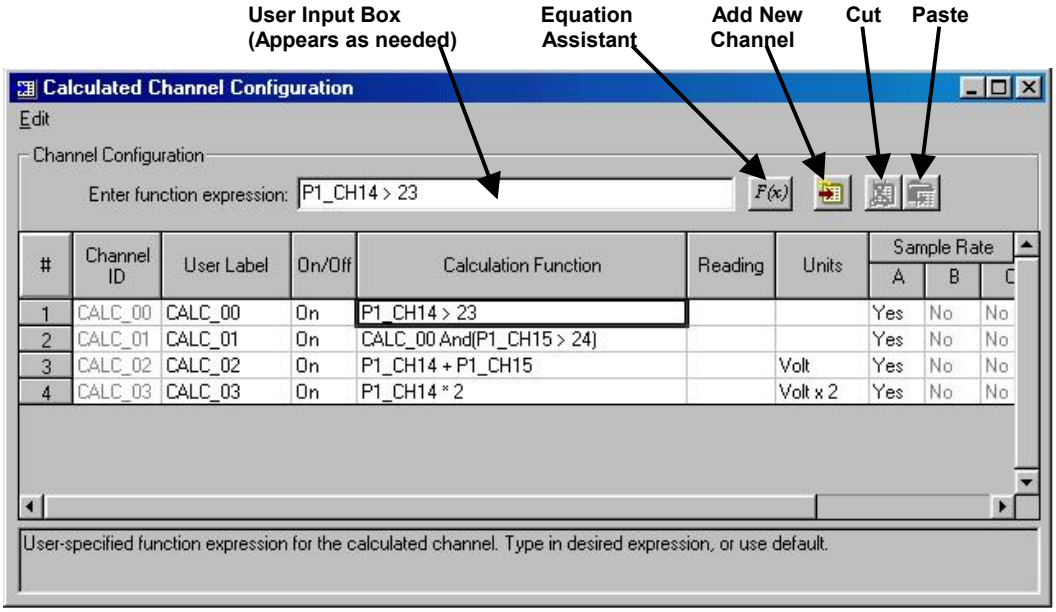
Reference Note: Refer to the *GPS & Serial Device Data Collection* section in chapter 5 of the LogBook User's Manual for detailed information.

Calculated-Channel Configuration

LogBook can derive virtual channels from real and/or virtual channels using math operators and functions. The resulting virtual channels can be used to:

- Create alarms based on any combination of signal levels from real channels and logical or mathematical functions of virtual channels
- Reduce data through statistical operations, comparisons, etc.
- Develop sophisticated trigger equations using a series of averaging, comparing of other real and virtual channels
- Manipulate input channel values for a more useful output (perhaps the quantity of interest cannot be measured directly but depends on a complex derivation from several measurements)
- Control external devices via digital output signals (like a simple Programmable Logic Controller)

Note: Calculated channels can have numeric values such as analog channel values. Calculated channels can also have digital values of 0 or 1. These channels can be stored in any one (or all 4) timebases set up in the *Acquisition Configuration Window*, in the same manner as other input channels.



Calculated Channel Configuration Windows with Calculation Function Examples

You can access the Calculated Channel Configuration window from the control window's View pull-down menu, or by using the Calc (fx) button. The window contains several columns that are easy to understand because of their labels, and their similarity to columns previously discussed. The Calculation Function column is a noted exception that is explained via the following four examples.

Note: Channel ID and Physical Channel nomenclature appear in the Calculation Function column. User Labels will not appear in the function column unless they are identical to a Channel ID, or a Physical Channel label.

Refer to the above screen shots for the examples which follow.

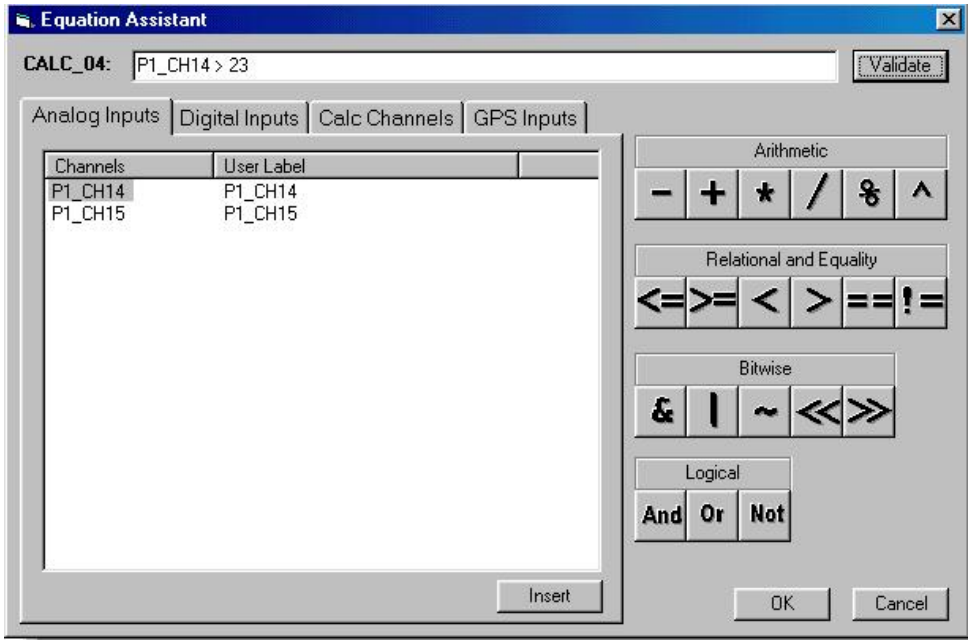
In addition to understanding the equation aspect of the following examples, you should also note the differences between the two types of configuration screens; i.e., an actual (real) channel and the calculated (virtual) channel.

Reference Note: You may wish to refer to math or programming books to derive calculation functions that suit your specific application.

Equation Assistant

The following window is opened by the F(x) button on the Calculated Channel Configuration window. The Equation assistant helps to ensure that the proper syntax is used in the Calculation Function column. Selecting the corresponding math and logic operators will enter the corresponding commands (these commands can also be typed in, but using the equation assistant can minimize syntax mistakes).

No recursion. A calculated channel cannot refer to itself directly or indirectly by creating a loop of inter-related calculations.



Equation Assistant Dialog Box

Equation Assistant Function Buttons					
Arithmetic					
-	+	*	/	%	^
(subtraction)	(addition)	(multiplication)	(division)	(modulus)[1]	(exponentiation)
Relational and Equality					
< =	> =	<	>	= =	! =
(less than or equal to)	(greater than or equal to)	(less than)	(greater than)	(equal)	(not equal)
Bitwise	**Note:** Bitwise functions are briefly discussed in the text which immediately follows this table.				
&	|	~	<<	>>	
(Bitwise And)	(Bitwise Or)	(Bitwise Not)	(Shift Left)	(Shift Right)	
Logical	**Note:** Logical functions are briefly discussed in the related text which follows this table.				
And	Or	Not			

[1] **Note:** Modulus has several possible meanings. As used in the equation assistant, modulus is the remainder which results when the first operand is divided by the second. For example: the modulus for 3 % 3 is 0; the modulus for 3.257 % 3 is 0.257; and the modulus for 5 % 2 is 1.0.

Bitwise Operators

The bitwise operators perform bitwise-AND (&), bitwise-OR (|), and bitwise-Not (~) operations.

Syntax

AND-expression & equality-expression
OR-expression | Not-expression
Not-expression ~ AND-expression

The operands of bitwise operators must have integral types, but their types can be different. These operators perform the usual arithmetic conversions; the type of the result is the type of the operands after conversion.

& The bitwise-AND operator compares each bit of its first operand to the corresponding bit of its second operand. If both bits are 1, the corresponding result bit is set to 1. Otherwise, the corresponding result bit is set to 0.
Example: 10110000 **&** 10010000 = = 10010000

| The bitwise-OR operator compares each bit of its first operand to the corresponding bit of its second operand. The operator is inclusive in that, if either bit is 1, the corresponding result bit is set to 1. Otherwise, the corresponding result bit is set to 0.
Example: 10110000 | 10010000 = = 10110000

~ The bitwise-NOT operator creates a bitwise compliment of its operand. Thus, a 0 switches to 1, and a 1 switches to 0.
Example: ~ 10110000 = = 01001111

Bitwise Left Shift and Right Shift Operators: **<<**, **>>**

Syntax:

shift-expression << additive-expression
shift-expression >> additive-expression

The bitwise shift operators shift their first operand left (<<) or right (>>) by the number of positions the second operand specifies.

Example: 10110000 << 2 = = 11000000

Logical Operators

The logical operators perform logical AND, logical OR, and logical NOT operations.

Logical operators do not perform usual arithmetic conversions. Instead, they evaluate each operand in terms of its equivalence to 0. Thus, the result of a logical operation is either 0 or 1.

AND The logical-AND operator produces the value 1 if both operands have nonzero values. If either operand is equal to 0, the result is 0. If the first operand of a logical-AND operation is equal to 0, the second operand is not evaluated.

OR The logical-OR operator performs an inclusive-OR operation on its operands. The result is 0 if both operands have 0 values. If either operand has a nonzero value, the result is 1. If the first operand of a logical-OR operation has a nonzero value, the second operand is not evaluated.

The operands of logical-AND and logical-OR expressions are evaluated from left to right. If the value of the first operand is sufficient to determine the result of the operation, the second operand is not evaluated. This is called "short-circuit evaluation."

NOT The logical-negation (logical-NOT) operator produces the value 0 if its operand is true (nonzero) and the value 1 if its operand is false (0). The operand must be an integral, floating, or pointer value.

Example 1: P1_CH14 > 23

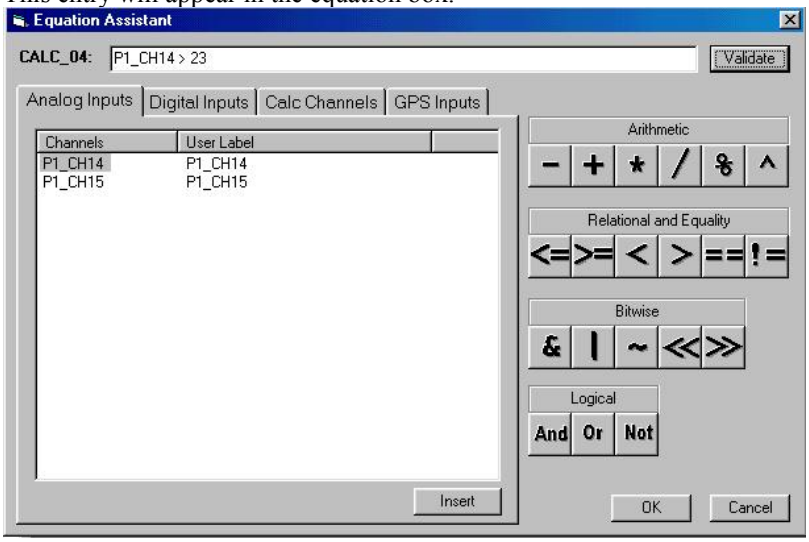
In this example the user wants to use CALC_00 as a logic indicator based on the state of physical channel P1_CH14; thus channel CALC_00 will read 1 or 0, depending on the value of the physical channel's reading.

The user created a calculation function: **P1_CH14 > 23**. The calculation channel is labeled **CALC_00** as seen in the following figure.

Assume P1_CH14 had a reading of 26.13. Since 26.13 is greater than the value 23 in the calculation function, CALC_00's reading would appear as 1.0. If the channel P1_CH14 reading drops to 23 or lower, CALC_00 will read 0.0. Note that CALC_00 can be used in additional equations as will be seen in example 2.

To obtain a calculation channel, select the *Calculated Channel Configuration* window's **Edit** pull-down menu, then select **Add Channel**. In regard to the calculation function column, the following steps highlight how to enter the function used in this first example, i.e., **P1_CH14>23**.

1. Ensure the physical channel to be referenced is enabled. In this case: P1_CH14.
2. Use the **Calc (y = fx)** button in the toolbar or Calculated Channels from the View pull-down menu to access the Calculated Channel Configuration Window.
3. Select the **Edit** pull-down menu (located on the Calculated Channel Configuration window).
4. Select **Add New** to add a calculation channel. In our first example this is **CALC_00**.
5. Click on the cell in the **Calculation Function Column**.
   A ***F(x)*** button appears by the Enter Function Expression dialog box.
6. Use the ***F(x)*** button to access the *Equation Assistance dialog box*.
7. In the *Equation Assistant* box, double-click on the desired reference channel. P1_CH14. This entry will appear in the equation box, located just below the title bar. Note that you may type the channel, and other equation entries in this box, if desired.
8. From the Relational and Equality buttons (<=, >=, <, >, = =, !=) select the "greater than" symbol (>). This entry will appear in the equation box.

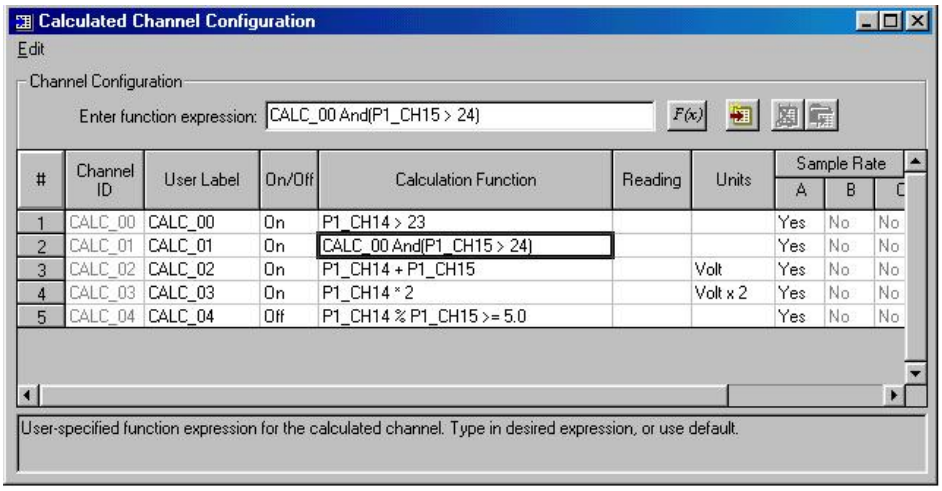


Equation Assistant Dialog Box

9. With the cursor placed after the greater than symbol, type 23.
10. Verify that your function appears correctly and click the **Validate** button. Validate will verify that you have a useable equation and will inform you when there is a problem with an equation. For example, you may have a missing parenthesis.
11. If necessary, correct your equation and validate the new one.
12. Click the **OK** button. This closes the Equation Assistant.

Though the previous ten steps pertain to the first example, aside from functional differences, the method is essentially the same for the remaining three examples. A figure and table have been placed after the examples to identify various button options available with the Equation Assistant.

Example 2: CALC_00 And(P1_CH15>24)



Look at row 2 in the *Calculated Channel Configuration* screen above. You will see that the user created a calculation function of **CALC_00 And(P1_CH15 > 24)** for the calculation channel having the channel ID of CALC_01. In this example the user wants to use CALC_01 as a logic indicator based on the state of both CALC_00 and physical channel P1_CH15.

In this example, channel CALC_01 will read 1 if both of the following are true:

a) CALC_00 has a value of 1.0
b) P1_CH15 has a value greater than 24

Assume that P1_CH14 had a channel reading of 23.09 and that P1_CH15 had a value of 21.81. In this case, CALC_00 will have a value of 1.0 because P1_CH14 is greater than 23. P1_CH14>23 was set in example 1.

In our example 2 function of **CALC_00 And(P1_CH15>24)** it is clear that although the first condition is satisfied, we can see that the second is not, since P1_CH15 has a reading of 21.81. Because both conditions are not satisfied, CALC_01 reads 0.0. Note that CALC_01 can be used in additional equations.

Example 3: P1_CH14+P1_CH15

Look at row 3 in the Calculated Channel Configuration screen (previous figure). You will see that the user created a calculation function of **P1_CH14+P1_CH15** for the calculation channel having the channel ID of CALC_02. In this example the user wants to use CALC_02 to indicate to sum of two physical channels, i.e., P1_CH14 and P1_CH15.

In this example, assume that:

a) P1_CH14 reads 25 volts, and
b) P1_CH15 reads 24 volts

In this case CALC_02 will be the sum, 49 volts.

Note that CALC_02 can be used in additional equations.

Example 4: P1_CH14*2

Look at row 4 in the Calculated Channel Configuration screen (previous figure). You will see that the user created a simple calculation function of **P1_CH14*2** for calculation channel CALC_03. In this example the user wants CALC_03 to read twice the value of physical channel P1_CH14.

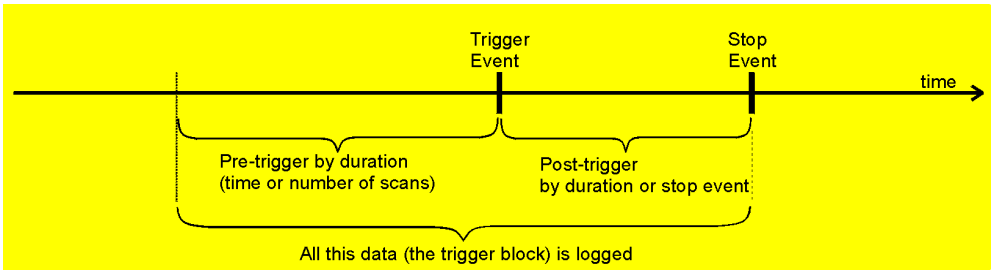
Note that CALC_03 can be used in additional equations.

Acquisition Configuration

The Acquisition Configuration dialog box allows you to define trigger conditions including various parameters for pre-trigger, trigger, post-trigger, scan rate and timebase.
LogBook data can be collected in two basic ways depending on the trigger setup:

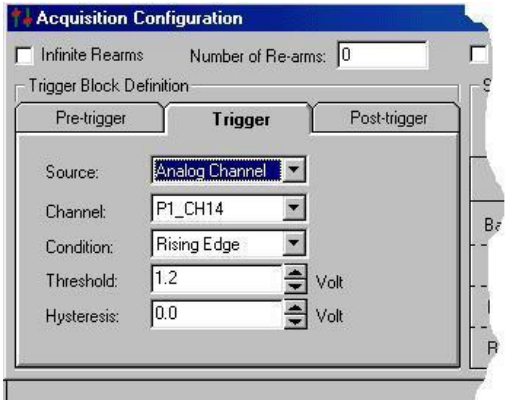
- Continuous. As a simple data logger in a strip chart mode, all data collected is then saved. The trigger source can be set to immediate and the post-trigger scan count set to infinite.
- Exception-only. As an exception-capturing system, collected data is saved only under specified conditions. Pre-trigger, post-trigger, and re-arm parameters allow you to collect only data around specified events, just the data of interest, nothing more. Thus memory is conserved, and post-analysis is easier.

The next figure shows a time line with data being collected continuously, but only the trigger block is logged to memory (the pre-trigger and post-trigger data combined is called a trigger block).

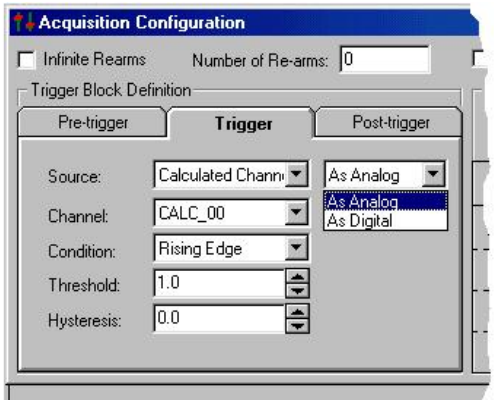


Trigger Parameters Setup

The following figures represent Trigger Setups with and Analog Channel as a trigger source (channel P1_CH14) and a Calculated Channel as a trigger source (CALC_00).
Other possible trigger sources are:
When Armed, Manual, Digital Channel, GPS Channel (LogBook/360 only), and Absolute Time.



Trigger Setup Using an Analog Channel



Trigger Setup Using a Calculated Channel

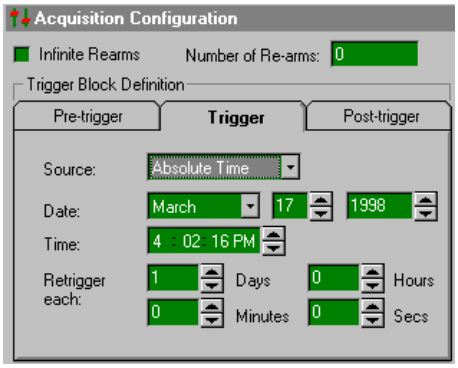
The manual trigger can be implemented in the following ways:

- With a PC attached, you can trigger LogBook from *LogView's* LogBook Monitor window in the Device menu.
- Without a PC, you can use the Remote LogBook Terminal (LBK1) manual trigger button.

The auto re-arm feature allows for a large number of acquisitions to take place automatically, with each acquisition using the same settings. As soon as the previous trigger block is terminated, the system immediately re-arms itself, waiting for the trigger condition to be satisfied. The Number of Re-arms field allows you to specify how many triggered acquisitions to capture. For *exception-capturing*, specify the number of trigger blocks that should be collected before data logging is terminated. For continuous data logging, specify 1 trigger block.

If **Absolute Time** is selected for the trigger source, the window changes as shown in the figure at right. The parameters include the date and time as well as options for re-triggering after a specified duration.

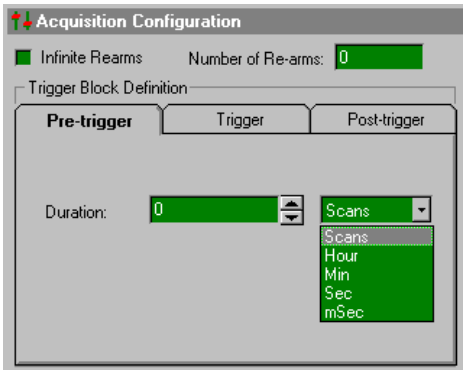
A wide variety of trigger sources and stop events provide great flexibility in exception-capturing. If data collection is desired only under specific conditions, appropriate trigger conditions can be so specified. Besides the trigger event, you can define a pre-trigger and post-trigger for the trigger block. An example of *exception-capturing* would be to collect 100 pre-trigger scans and 1000 post-trigger scans every time a designated channel read a specified temperature.



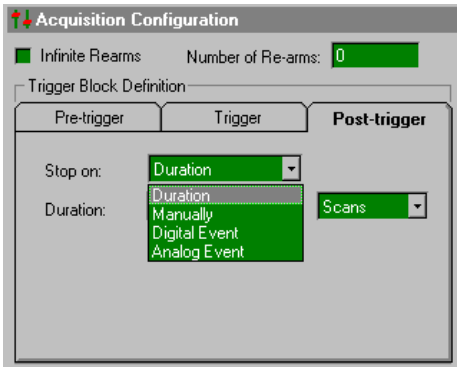
Using Absolute Time as a Trigger Source

To conserve memory when collecting high-speed data, use the trigger to take snapshots of information only during the appropriate periods.

When using a trigger to start the acquisition, a pre-trigger count can be supplied so that information just before the trigger can be collected and saved (LogBook's buffer allows pre-trigger data to be stored temporarily until saved in a trigger block). The post-trigger definition specifies when the data collection activity should end.



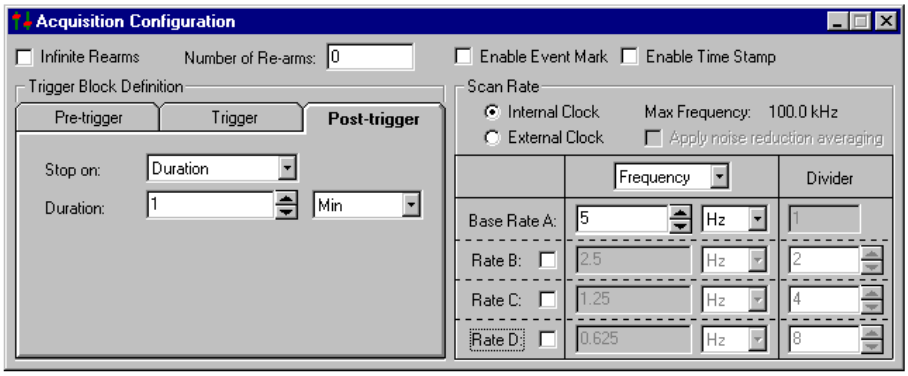
Pre-Trigger Setup



Post-Trigger Setup

You can also use a calculated channel as a trigger source, but you must use an analog output or digital channel as an intermediary. The calculated channel can be based on real channels and user logic to create an analog output channel or a digital output channel that could then be the input for the trigger event or stop event. A calculated channel can describe virtually any combination of channel conditions. For example, you can develop a calculated channel called TRIG and specify it as the trigger channel. If the channel's equation is TRIG = (Temp1-Temp2)>50.0°, the data collection process will be triggered when the difference between the 2 channels is greater than 50.0°.

Scan Rate Setup



Scan Rate Setup. Accomplished on the right-half of the Acquisition Configuration Window.

The Scan Rate block is the right half of the *Acquisition Configuration window* (see previous figure). To set the scan rate, you can use LogBook's "internal" clock, or an "external" clock. Brief descriptions follow.

Note: The scan-to-scan time is not recorded when tracking variable-speed events.

- **Internal Clock**. The scan-to-scan timing may be set by a fixed-frequency pacer clock. LogBook's time-of-day clock has 1/16-second resolution for data-logging applications where acquisitions must be performed at specific times during the day. The time of occurrence for each acquisition and its trigger are recorded with the data. The internal clock can be reset in the *LogBook Monitor window* in the Device menu.

- **External Clock**. Each scan may be individually started by an external TTL level trigger to allow the scan rate to track an external, variable-speed event (such as engine revolutions). The external clock signal is applied to LogBook through pin 20 of the P1 DB37 Analog I/O connector. The P1 pinout is included in chapter 4 of the LogBook User's Manual.

  ***Question**:* Why is the Pin 20 [for the external clock] identified as PCRCLK output/input?
  ***Answer**:* When LogBook is set for an external user-supplied pacer, pin 20 has an input function. When LogBook is set to make use of its internal FPGA (Frequency Pulse Gain Amplifier) supplied pacer, pin 20 is driven as an output. This allows instrumentation external to LogBook to be triggered in sync with LogBook scans.

  ***Question**:* On what edge is the sample taken? Rising or Falling?
  ***Answer**:* Rising edge, low-to-high direction, where the *minimum pulse high-time* equals the *low time* (100nsec).

For applications with both slow and fast phenomena, sampling slow signals at a slower rate while maintaining high rates for fast signals will conserve memory. For example, channel 1 may read fast signals like vibration and can be sampled at the high (base) rate; channel 2 may read slow signals like thermocouples and can be sampled at a lower rate. A Base Rate A and up to 3 more rates (B, C, D) can be configured; but only one base rate can be defined for the entire system and it should be set for the fastest scan required. The B, C, D rates must be integer (whole number) divisions of the base rate. It is also possible to scan the same channel at several rates.

Note: A separately indexed data file is created for each scan rate.

The checkbox "**Apply noise reduction averaging**" refers to auto-averaging for scan rates B, C, and D. All channels are scanned at the base rate; but they may also be scanned at divisions of the base rate. Two advantages to averaging are noise reduction by limiting the effect of extraneous readings and storage savings since fewer values are stored.

- **Averaging**. Checking this box, the readings from the base rate will be averaged, and the average value will be entered for the derived rate scan. If the scan rate B is ¼ of the base rate A, then four A readings will be averaged for each B reading.

- **No averaging**. Not checking this box, the readings at the derived scan rates will be exactly the same for that time-point as the base rate.

Event Marking/Time Stamping

The top right side of the Acquisition Configuration window allows you to manually mark events and/or insert an absolute time reference for each scan:

- **Enable Event Mark** sets up the acquisition for an operator to press the Event Mark button in the *LogBook Monitor window* or on the LBK1 remote operation terminal. Whenever the button is pressed, that data point is added to the data file.

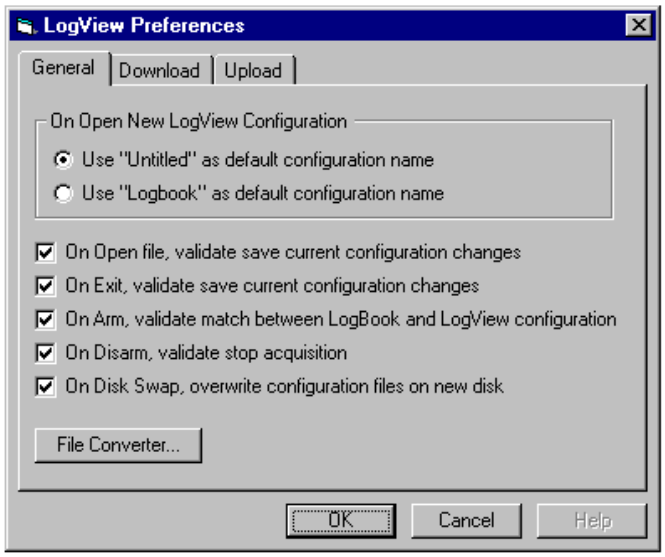
- **Enable Time Stamp** sets up the acquisition to automatically add the time (to ms) and date to the data file for every scan.

Preferences

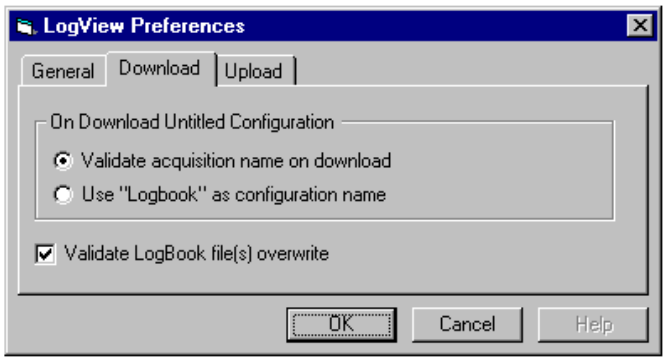
(no toolbar icon)

LogView allows you to set various parameters to make your application more useful and convenient. These preference settings are divided into 4 tabs as shown in the figures on the right.

Most of the options cover default use of filenames and validating changes to files.

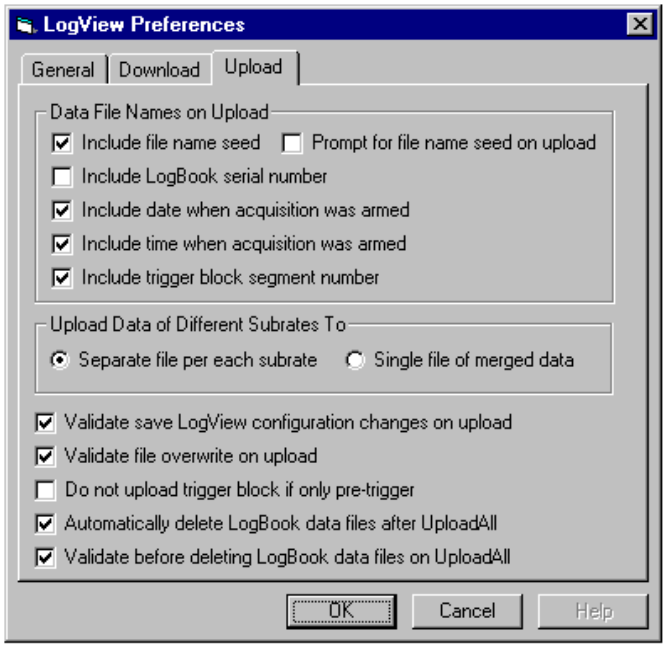


LogView Preferences, General Tab Selected



LogView Preferences, Download Tab Selected

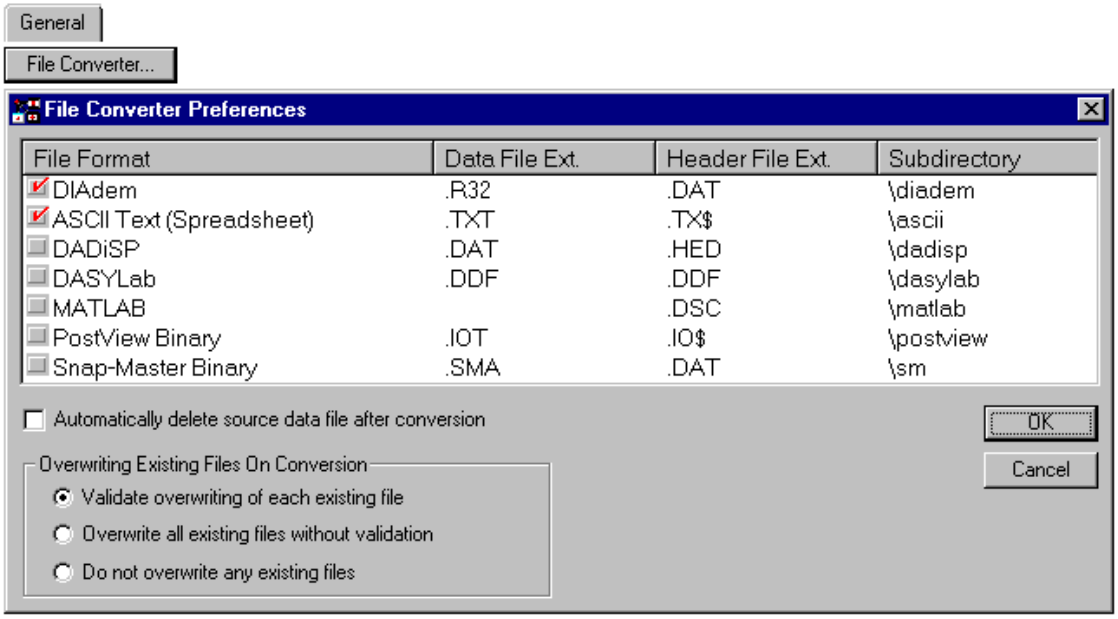
As explained in the *File Management* section (see page pg. 9), *LogView* can generate multiple data files for an acquisition and then automatically name them. These names have a long format with several fields (seed, serial number, date armed, time armed, trigger block/segment). Unless you need the long-format name to prevent file overwrites, you can uncheck the fields you don't need. For example, if only using one LogBook, the serial number is not needed.



LogView Preferences, Upload Tab Selected

For data conversion:

1) Select the *LogView* Preferences "General Tab."
2) Click on the "File Converter" button. The *File Converter Preferences* dialog box appears.
3) Select the formats you want to save your data in.
4) If desired, check to automatically delete the source data file after conversion. The default avoids automatic deletion of the source data file.
5) Select the overwriting-related preference you desire. The default is to "Validate overwriting of each existing file."



File Converter Preferences Dialog Box

Device Menu

Select PC Card
Select LogBook
Attach
Break
Arm Acquisition
Stop Acquisition
LogBook Monitor
Explorer

The Device menu allows you to choose devices in your system, attach or break connection to the system, and to start and stop an acquisition.

Select PC-Card

(no toolbar icon)

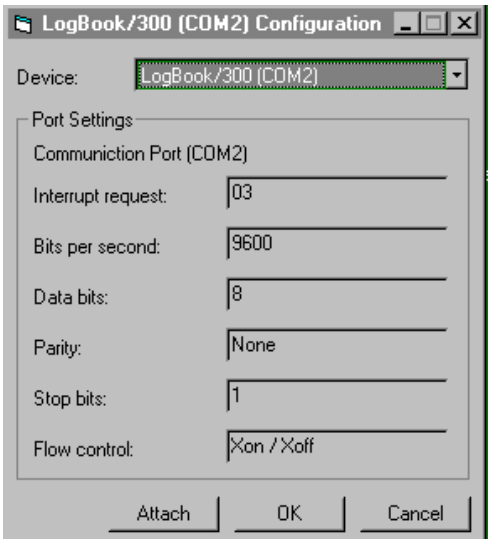
Select PC-Card allows you to choose which drive on your computer you wish to make active for uploading and downloading—especially relevant if your computer has more than one PC-Card slot.

Select PC-Card

Select LogBook

(no toolbar icon)

Select LogBook allows you to choose devices from your system and then verify or change the communication port settings.



Select LogBook

Attach allows you to establish connection with a LogBook. If no LogBook is connected, *LogView* will automatically attach to a PC-Card in the user-specified PC-Card drive (specified in the "Select PC-Card" dialog box).

Break allows you to break the connection with an attached LogBook.

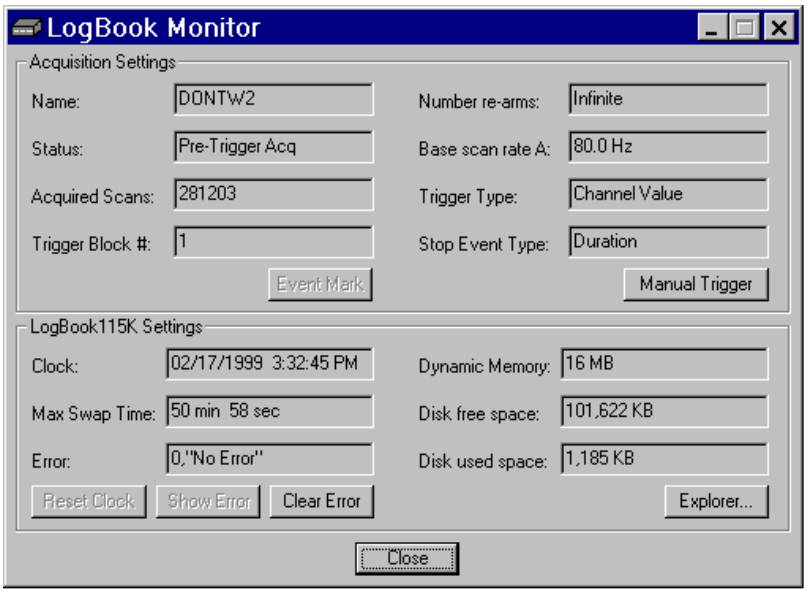
Arm Acquisition Arms the acquisition for the selected device. The scan will begin when the selected trigger condition is met.

Stop Acquisition will disarm the acquisition for the selected device. No data will be collected despite trigger conditions until the acquisition is armed (started).

LogBook Monitor

(no toolbar icon)

The LogBook Monitor provides a system status report on the current acquisition (if in progress). The window allows provides access to manual-trigger and chart-marking functions. You can access LogBook's Explorer by clicking the button in the lower right-hand corner of the screen. The Explorer allows you to search the PC-Card for acquisition files and the indexed trigger blocks within the acquisition files (see following section for more Explorer information).



LogBook Monitor

The acquisition status is only updated every 1 or 2 seconds; the status for scans at a faster rate may not be updated before the scan is finished.

Whenever you select the **Event Mark** button during an acquisition, *LogView* notes the exact time to time-correlate the marked instant with data collected then. This function is like marking a strip chart to draw attention to a particular time frame. These marks can be seen later while reviewing the data in an independent view application.

The Enable Event Mark (in the Acquisition Configuration window) must be checked in order for the LogBook Monitor to be enabled. This event-marking feature is also accessible via LBK1.

***Max Swap Time* (Maximum Disk Swap Time) is the estimated amount of time that the user has to remove and replace LogBook's PCMCIA card without interruption to LogBook's active acquisition.**

The Manual Trigger button is available here and will activate the trigger or post-trigger event immediately when selected (also accessible via the LBK1).

Under LogBook Settings, you can read the current time of LogBook's clock. You can reset LogBook's clock to the PC's clock by selecting the **Reset Clock** button.

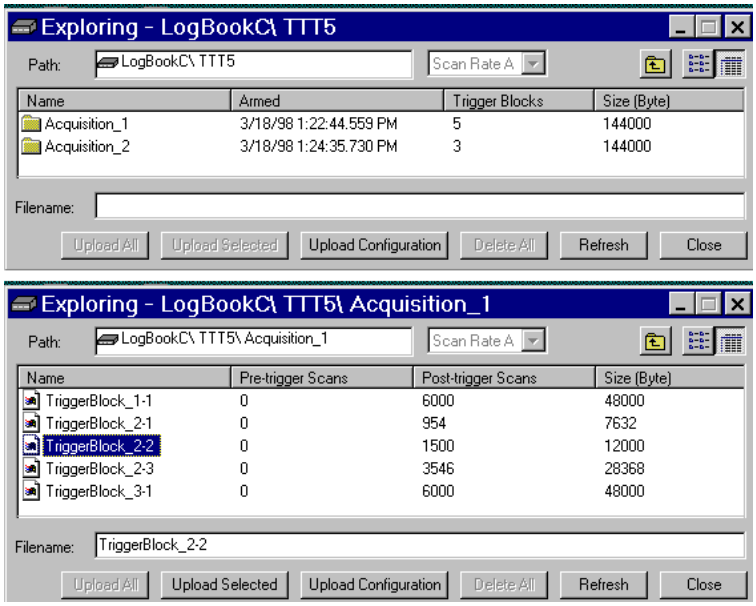
The Error box contains an error number and brief description of the error. These error codes are provided near the end of this manual. Not all errors are fatal to the acquisition.

Explorer

(no toolbar icon)

The Explorer window can be reached from the Device menu or from its button in the *LogBook Monitor window*. Explorer allows you to search the PC-Card for acquisition files and the indexed trigger blocks within the acquisition files. The Exploring windows look first at the acquisitions saved to disk and then deeper into each trigger block within an acquisition.

The convention for naming files is described on page pg. 9. In the example shown at the right, TriggerBlock_2-2 uses "TriggerBlock" as the seed and "2-2" to indicate the 2nd segment of the 2nd trigger block. The binary data file ends with the .bin extension understood in the *LogView Explorer*.



LogBook Explorer Window, Two Examples

Tools Menu

Convert Binary Data
Merge Binary Data
View Data

The Tools menu provides three selections:

- **Convert Binary Data** - allows you to convert raw binary data (***.bin** files) into other formats that you may find more useful.
- **Merge Binary Data** – allows you to *merge Rate files* and to *concatenate Trigger Block segments*.
- **View Data** – Accesses the independent view program for graphing and analysis of previously recorded data.

Convert Binary Data

(no toolbar icon)

The **Convert Binary Data** menu option allows you to convert raw binary data (***.bin** files) into other formats that you may find more useful. You must first select an existing binary file to be converted. The filename can be typed in or selected by the Browse button that leads to a folder/file search window. After a file is selected (or multiple files), you can toggle check-boxes on/off for each format type. When ready to begin the conversion, select the Convert button and set up the destination folder/filename.

Data collected with LogBook can be uploaded to your PC's hard disk in any or all of several data formats for post-acquisition analysis. Some of the available file formats include Snap Master, DADiSP, Matlab, and ASCII (Excel) which is compatible with most software for analysis. *LogView* creates the necessary header files for each data format so that the software can use the channel labels, the timebase information, and other parameters.

Converted data files are placed in format-specific subdirectories of the binary source file directory.

Rates, Trigger Blocks, and Segments

LogBook has the capacity to save channel data at four independent rates. For each enabled rate, a file is created. For example, if all four rates are being used, four files will be present after an upload. Depending on the *Upload Preference* settings (as discussed in Preferences, page pg. 46), the file names will look similar to the following.

TEST R1 B1-1.BIN	"TEST" is the name of the acquisition configuration.
TEST R2 B1-1.BIN	"Rn" shows the rate number. R1 through R4 is Rate1 through Rate 4.
TEST R3 B1-1.BIN	"Bn-m" shows the trigger block and segment numbers.
TEST R4 B1-1.BIN	For example, B1-1 indicates "Block1, Segment 1."

Note: Files with high rates take up more memory than files with slow rates.

Auto Re-arm is used when multiple trigger events need to be captured. When the auto re-arm feature is enabled, LogBook will arm itself, wait for a trigger, collect the pre- and post-trigger, then re-arm itself and repeat the process.

The pre- and post-trigger data surrounding a *trigger point* is called a *Trigger Block*. A new file is created for each Trigger Block. If only one *rate* is used and three *Trigger Blocks* are collected, the file names would look similar to the following.

TEST R1 B1-1.BIN	In each case, R1 indicates Rate 1. B1, B2, and B3 indicate Trigger Blocks 1, 2, and 3, respectively. The "-1", in each case, indicates Segment 1.
TEST R1 B2-1.BIN	
TEST R1 B3-1.BIN	

Uploads can be performed while data is being collected. For applications that require continuous acquisition, uploads can be performed periodically to make space for additional data. **Each uploaded portion of a single *Trigger Block* is called a *Segment*.** If one rate is used and a Trigger Block was uploaded in five *Segments*, the file names would look similar to the following.

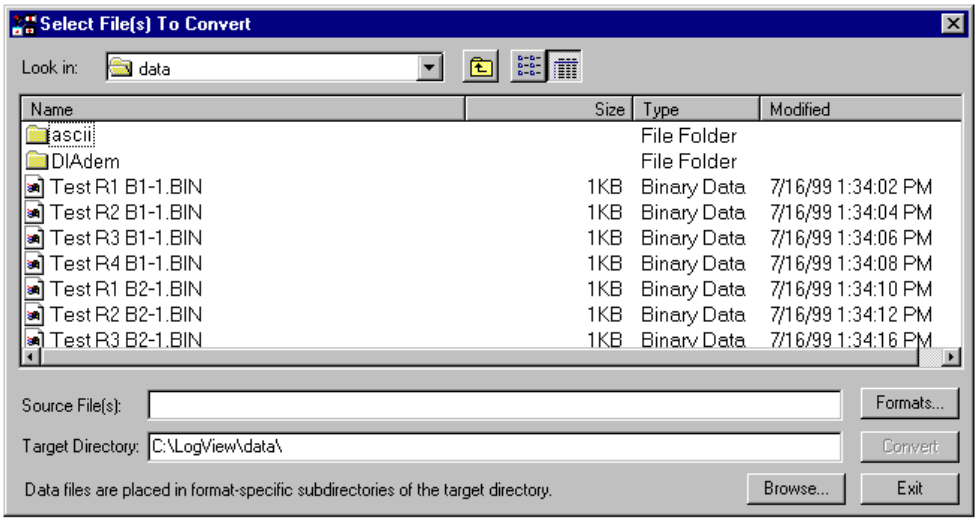
TEST R1 B1-1.BIN	In each case, R1 indicates Rate 1. B1 indicates Trigger Block 1, and "-1" through "-5" indicates Segment 1 through Segment 5.
TEST R1 B1-2.BIN	
TEST R1 B1-3.BIN	
TEST R1 B1-4.BIN	
TEST R1 B1-5.BIN	

Merging and Concatenating

LogView's ***raw binary format*** can not be used by other programs; however, *LogView* can convert its data files into popular file formats used by other display and analysis packages. The conversion can be performed automatically during an upload, or manually after the upload using the *Convert Binary Data* utility (found under the **Tools** pull-down menu).
In addition to providing for file format conversion, the *Convert Binary Data* utility also has the ability to *merge Rate files* and to *concatenate Trigger Block segments*. Examples follow shortly.

- When *merging Rate files*, the utility takes the appropriate rate files and combines them into one file.
- When *concatenating segments*, the utility joins the appropriate segment files, making one continuous Trigger Block file.
- When both *Merge* and *Concatenate* are enabled, Trigger blocks with multiple rates (that were uploaded in segments) can all be consolidated into one file.

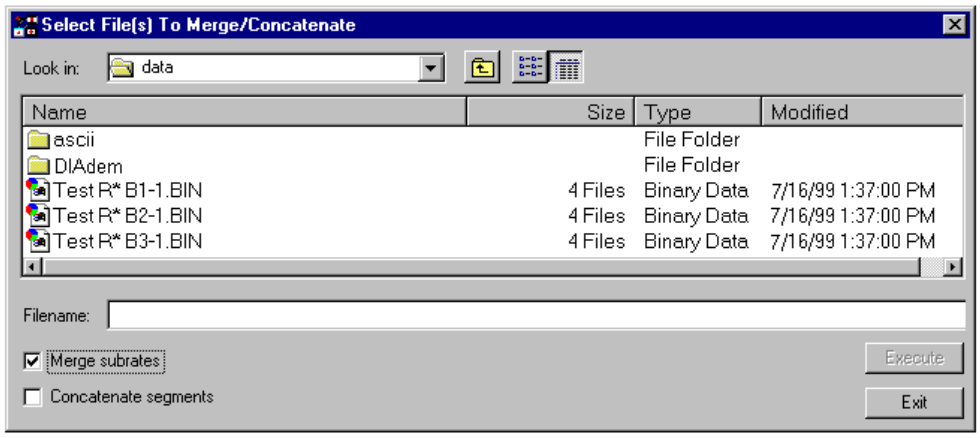
The *Convert Binary Data* utility lists all the raw binary files in the DATA directory. Select the desired file(s) and click Convert to initiate the process. In this way, any Trigger Block, Segment, or Rate file can be individually converted.



Sample Screen from the Convert Binary Data Utility

Merging Binary Data

(no toolbar icon)



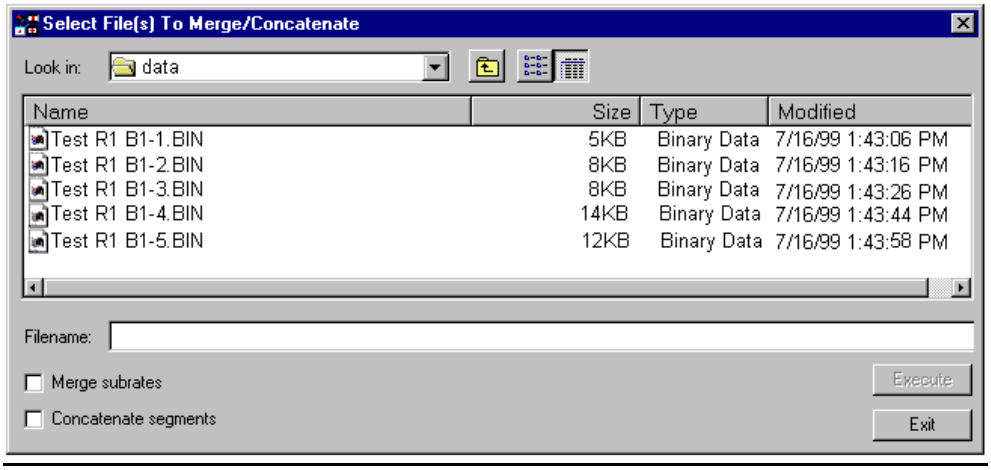
Preparing to Merge Subrates

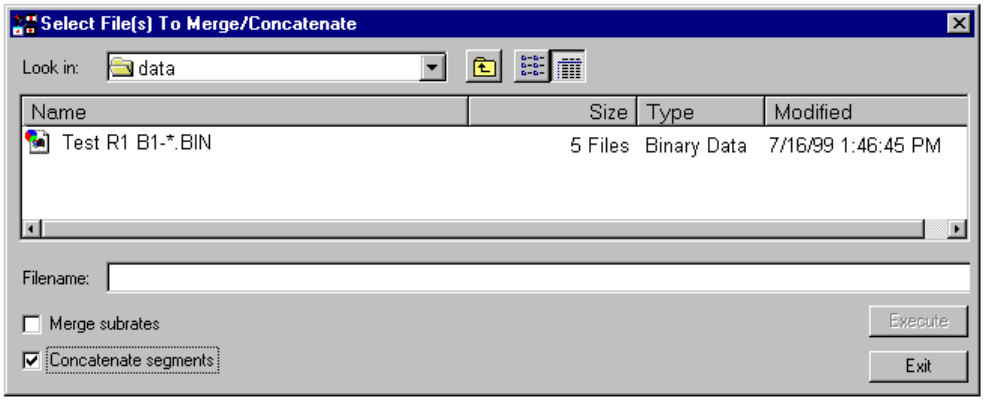
A screen similar to that shown in the above figure appears when the "Merge Binary Data" is selected from the Tools pull-down menu. On this window, when the ***Merge Subrates*** box is checked, the *Convert Binary Data* utility groups the related Rate files together and displays a single item. In the example below this single item is: **TEST R* B1-1.BIN**.

The number of files that this item describes is now shown in size column of the list box (4 files). Selecting **TEST R* B1-1.BIN** and then clicking the *Execute* button (lower right) will convert and merge the files.

TEST R1 B1-1.BIN --------→ TEST R* B1-1.BIN
TEST R2 B1-1.BIN |
TEST R3 B1-1.BIN |
TEST R4 B1-1.BIN __|

Concatenating (Linking) Segments





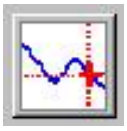
File Convert Utility Screen Shown Both Before and After Selecting "Concatenate Segments"

When the *Concatenate Segments* box is checked, the File Convert utility groups the Segment files together and displays a single item. In the example, the single item is **TEST R1 B1-*.BIN**. The number of files that this item describes is now shown in size column of the list box (5 files). Selecting **TEST R1 B1-*.BIN** and then clicking the *Execute* button (lower right of utility) will both convert and concatenate the files.

TEST R1 B1-1.BIN --------→ TEST R1 B1-*.BIN
TEST R1 B1-2.BIN |
TEST R1 B1-3.BIN |
TEST R1 B1-4.BIN |
TEST R1 B1-5.BIN __|

Note: For applications that require continuous data collection, the *Upload Scheduler* can periodically upload the data to a local PC, creating new space on the LogBook's PC-Card. The Upload Scheduler is discussed in the *LBK Options* chapter of the LogBook User's Manual.

View Data



The **View Data** button launches an independent post-data acquisition view program, if installed. Examples of view programs are DIAdem and the eZ-Analyst set of view applications. The *Post Acquisition Data Analysis User's Guide* PDF documents the applicable application(s). The PDF document is automatically installed onto your computer's hard-drive as a part of LogBook product support at the time of software installation.

Indicators Menu

Bar Graph Meters
Analog Meters
Digital Meters
Enable Input Reading Column
Start All Indicators
Stop All Indicators

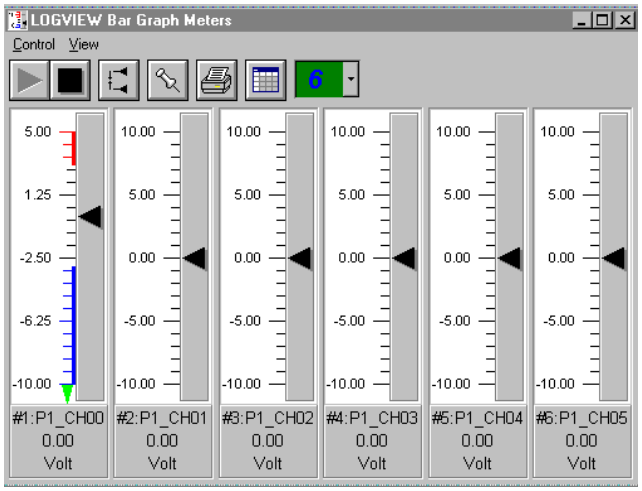
Along with displaying channel data in real time in the setup spreadsheets, *LogView* also provides auxiliary real-time indicators.

The meter windows simulate the look of popular meter types: the bar graph, the analog dial, and the digital readout. Within each meter type, you can adjust their display properties to fit your needs. Such properties include number of channels, high/low limits, peak hold, trend indicator, etc.
Next, each meter type is shown; and then, their configuration is discussed (they all work in a similar way).

Bar Graph Meters

(no toolbar icon)

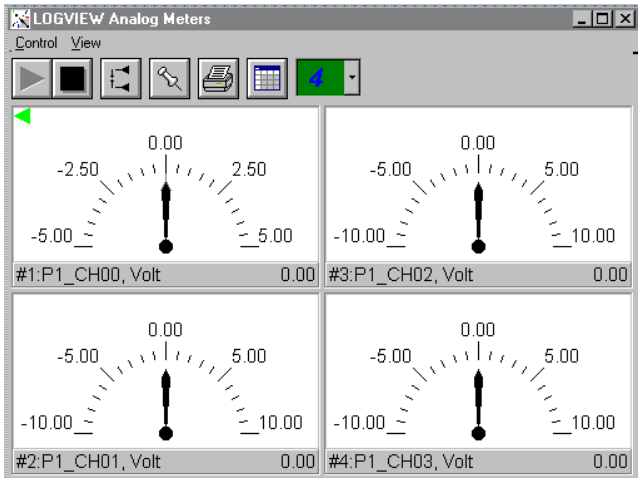
Selecting the Bar Graph Meter icon brings up the Bar Graph window to display several channels in bar graph format. To activate the display, select the Start button on the left side of the toolbar (or Start All Indicators in the pull-down menu or in the toolbar). You can vary the number of channels (32 max) displayed by selecting the input box at the end of the toolbar. The Grid button (next to last item on toolbar) is used to arrange the display for convenient reading. The pushpin icon in the center of the toolbar locks this window on top of other windows until you unlock it by selecting the pushpin again.



Analog Meters

(no toolbar icon)

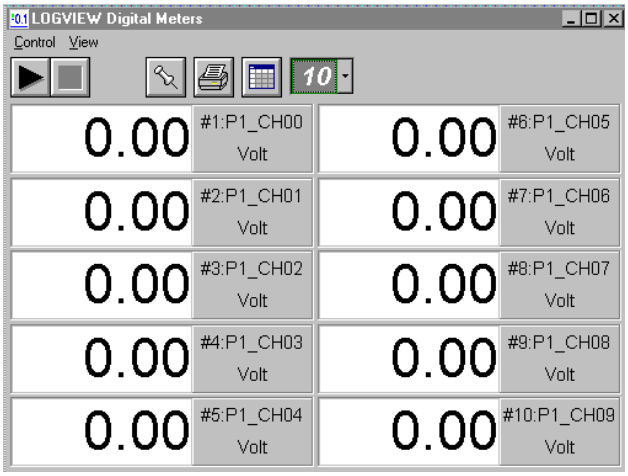
Selecting the Analog Meter icon brings up the Analog Meters window to display several channels in a dial/gage format. To activate the display, select the Start button on the left side of the toolbar (or Start All Indicators in the pull-down menu or in the toolbar). You can vary the number of channels (32 max) displayed by selecting the input box at the end of the toolbar. The Grid button (next to last item on toolbar) is used to arrange the display for convenient reading. The pushpin icon in the center of the toolbar locks this window on top of other windows until you unlock it by selecting the pushpin again.



Digital Meters

(no toolbar icon)

Selecting the Digital Meters icon brings up the Digital Meters window to display several channels in numeric format. To activate the display, select the Start button on the left side of the toolbar (or Start All Indicators in the pull-down menu or in the toolbar). You can vary the number of channels (32 max) displayed by selecting the input box at the end of the toolbar. The Grid button (next to last item on toolbar) is used to arrange the display for convenient reading. The pushpin icon in the center of the toolbar locks this window on top of other windows until you unlock it by selecting the pushpin again.



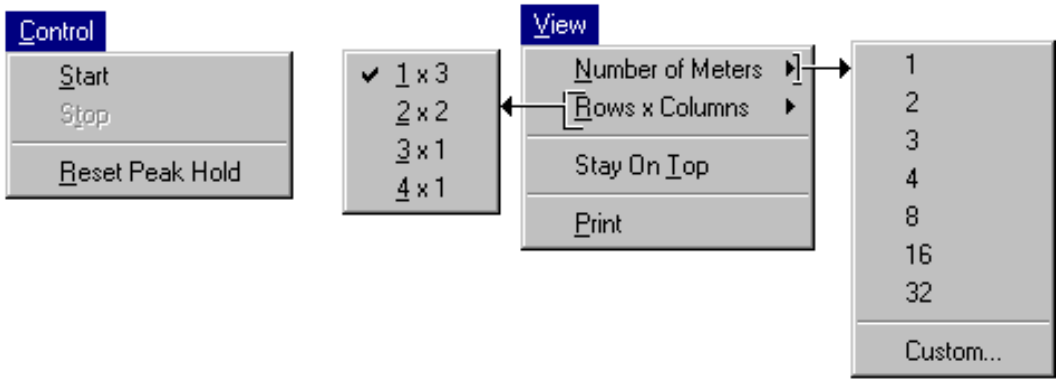
Meters Configuration

The toolbars and pull-down menus for the three meter types are identical except that Digital Meters does not have a Reset Peak Hold icon.

Meters Toolbar Icons

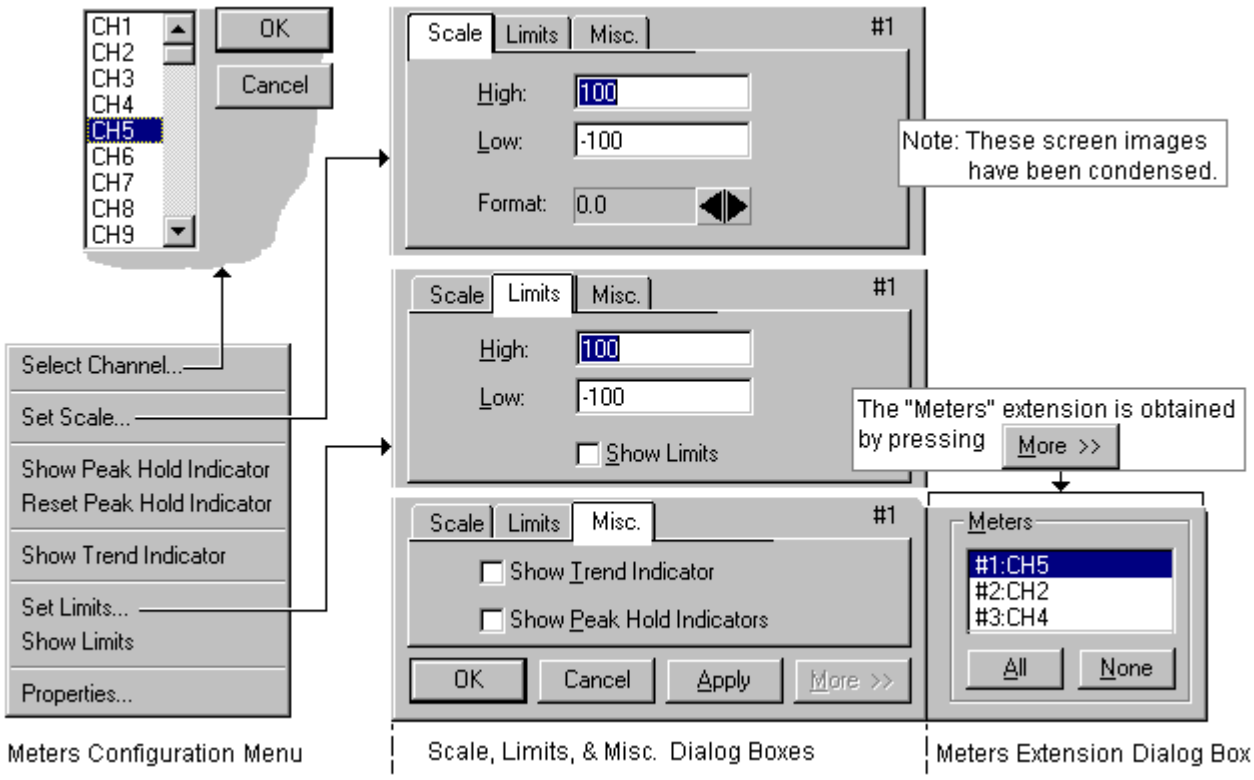
Item	Name	Function
	Start	Starts meters.
	Stop	Stops meters.
	Reset Peak Hold Indicator	Resets the floating markers. Upon reset, the markers will instantly adjust to indicate the highest and lowest values reached since the time of the reset. This feature does not apply to the Digital Meters.
	Stay On Top (Push pin)	Locks or unlocks the meter window on top of other windows.
	Print	Sends the meter(s) display image to connected printer.
	Rows x Columns	Opens a small menu with "row x column" arrangement options. *Example*: When the number of meters is 6 the grid options will be: 6x1, 3x2, 2x3, and 2x4 with the first number being the number of rows. If you then select 3x2 you will have 3 rows of meters with 2 meters per row.
	Number of Meters	Specifies the number of meters to appear on the screen. Up to 32 meters can be selected.

The meters windows each have a Control and View pull-down menu, as indicated by the following figure. These menu items correspond to the toolbar icons described above.



A meters configuration menu (lower left corner of figure) will appear when you place the mouse pointer over a meter and click the right mouse button. This menu allows you to access various dialog boxes for changing parameters for meters. The steps for configuring a meter are detailed below.

Note: The *Show Peak Hold Indicator / Reset Peak Hold Indicator* selections are not an option for Digital Meters and do not appear on the configuration window for digital meters.



Meter Configuration Menu and Related Dialog Boxes

Configuring a Meter

1. Bring up the desired meter group (Bar Graph, Analog, or Digital).
2. Place the mouse cursor over the meter to reconfigure.
3. Click on the right mouse button. A Meters Configuration Menu will appear (see figure above).
4. Select the desired option from the meter configuration menu.
5. If a dialog box is required, for example, to change a limit, enter in the new value in the appropriate parameter box and press "Apply" or "OK." Pressing "Apply" implements your changes, but keeps the dialog box open, allowing you to make additional changes. Pressing "OK" implements your changes and closes the dialog box.

The previous figure and the next table and the previous figure serve as a quick reference to meters configuration.

Configure Meter Settings, Function Descriptions	
Function	**Description**
Select Channel	Select a new channel for display. The selected channel will replace the one currently seen in the meter. Note that double-clicking the left mouse button in the meter region will also bring up a dialog box which allows you to select a new channel.
Set Scale	Set the high and low points of the scale as well as define the decimal place format.
Show Peak Hold Indicator	Places high and low uni-directional floating markers on the scale to indicate the highest and lowest values reached up to the present time. This feature does not apply to the Digital Meters selection.
Reset Peak Hold Indicator	Resets the floating markers. Upon reset, the markers will instantly adjust to indicate the highest and lowest values reached since the time of the reset. This feature does not apply to the Digital Meters selection.
Show Trend Indicator	Displays a pointer to indicate the direction of the trend. Note that during rapid meter fluctuations the increase and decrease pointers will appear to blink simultaneously.
Set Limits	Provides a way of establishing high and low limit set-points.
Show Limits	Displays limits by adding color (red for high, blue for low) to the scale regions which equal and exceed the set limit values. For Digital Meters the limits are indicated by red numbers and an upper red bar for hitting or exceeding the high limit; and blue numbers and a lower blue bar when reaching or exceeding the low limit.
Properties	Allows setting and showing limits, as well as opening the Scale dialog box.

You can access a different dialog box from the one initially selected. For example, from the Set Scale dialog box you can select Limits to access the Set Limits/Show Limits display, as well as select "Misc." which allows you to "Show Trend Indicator" and "Show Peak Hold Indicators."

Mouse buttons

- Left: Double-clicking the left mouse button in a meters scale area brings up a channel selection pop-up menu.
- Right: Single-clicking the right mouse button in a meters scale area brings up a configuration pop-up menu.

Enable Input Reading Column

(no toolbar icon)

This command enables/disables the "Reading" column of the Analog Input Channel Configuration spreadsheet to provide a numeric view of incoming data. This function toggles on and off when the menu item is repeatedly selected.

Note: With the input reading columns ON, no modifications to program parameters may be performed.

Start (or Stop) All Indicators

(no toolbar icon)

Starting or Stopping all indicators affects several windows if open, including: Reading column, Charts, Bar Graph Meters, Analog Meters, and Digital Meters. **Note**: you can start or stop any of these active windows separately using their own Start or Stop (Pause) buttons.

Error Codes

Software Errors

These errors can appear in the LogBook Monitor window of LogView.

0 No Error

Command Error Definitions

100 Command Error
101 Invalid Character
102 Syntax Error
103 Invalid Separator
104 Data Type Error
105 GET Not Allowed
108 Parameter Not Allowed
109 Missing Parameter
110 Command Header Error
111 Header Separator Error
112 Program Mnemonic Too Long
113 Undefined Header
114 Header Suffix Out Of Range
120 Numeric Data Error
121 Invalid Character In Number
122 Mantissa Too Large

Not Defined In SCPI

123 Exponent Too Large
124 Too Many Digits
128 Numeric Data Not Allowed
130 Suffix Error
131 Invalid Suffix
134 Suffix Too Long
138 Suffix Not Allowed
140 Character Data Error
141 Invalid Character Data
144 Character Data Too Long
148 Character Data Not Allowed
150 String Data Error
151 Invalid String Data
154 String Data Too Long
158 String Data Not Allowed
160 Block Data Error
161 Invalid Block Data
168 Block Data Not Allowed
170 Expression Command Error
171 Invalid Expression
178 Expression Data Not Allowed
180 Macro Definition Error
183 Invalid Inside Macro Definition
184 Macro Parameter Command Error

Execution Error Definitions

200 Execution Error
201 Invalid While In Local
202 Settings Lost Due To RTL
203 Command Protected
210 Trig Error
211 Trig Ignored
212 Arm Ignored
213 Init Ignored
214 Trig Deadlock
215 Arm Deadlock
220 Parameter Error
221 Settings Conflict
222 Data Out Of Range
223 Too Much Data
224 Illegal Parameter Value
225 Operation Out Of Memory
230 Lists Not Same Length
231 Data Corrupt Or Stale
232 Data Questionable
233 Invalid Format
240 Invalid Version
241 Hardware Error
250 Hardware Missing
251 Mass Storage Error
252 Missing Media
253 Corrupt Media
254 Media Full
255 Directory Full
256 File Name Not Found
257 File Name Error
258 Media Protected
260 Expression Error
261 MathError In Expression
270 Macro Error
271 Macro Syntax Error
272 Macro Execution Error
273 Illegal Macro Label
274 Macro Parameter Error
275 Macro Definition Too Long
276 Macro Recursion Error
277 Macro Redefinition Not Allowed
278 Macro Header Not Found
280 Program Error
281 Cannot Create Program
282 Illegal Program Name
283 Illegal Variable Name
284 Program Currently Running
285 Program Syntax Error
286 Program Runtime Error
290 Memory Use Error
291 Out Of Memory
292 Referenced Name Does Not Exist
293 Referenced Name Already Exists
294 Incompatible Type

Device-Specific Error Definitions

300 Device Specific Error
310 System Error
311 Memory Error
312 PUD Memory Lost
313 Calibration Memory Lost
314 Save Recall Memory Lost
315 Configuration Memory Lost
320 Storage Fault
321 Device Out Of Memory
330 Self Test Failed
340 Calibration Failed
350 Queue Overflow
360 Communication Error
361 Parity Error In Program Message
362 Framing Error In Program Message
363 Input Buffer Overrun

Query Error Definitions

400 Query Error
410 Query Interrupted
420 Query Unterminated
430 Query Deadlocked
440 Query Unterm After Indef Response

Power On Event Definitions

500 Lbk Event Power On
600 Lbk Event User Request
700 Lbk Event Request Control
800 Lbk Event Operation Complete
900 Outputs Deteriorating
905 Losing Trigger Events
906 Losing Stop Events

Hardware Errors

The following is a list of fatal hardware errors. LogBook's ERROR LED indicator (on the front panel) will blink on/off the number of times indicated by the flash code. If the LogBook is attached to an LBK1, the corresponding control terminal message will be displayed (otherwise, you must count the LED flashes to determine the error). Note that flash codes 08, 09, and 17 are associated with multiple errors and thus require an LBK1 to determine which error applies.

ERROR LED Flash Code	Control Terminal Message
1	NS486 Chip Revision Changed Error
2	Watchdog Timeout Error
3	Flash Startup Code Checksum Error
4	Flash FPGA Code Checksum Error
5	DRAM initialization not complete Error
6	DRAM Sizing Error
7	1 MB DRAM SIMM - Insufficient Memory
8	DRAM Address Line Error
8	DRAM Data Line Error
8	DRAM Integrity Test Error
9	SRAM Address Line Error
9	SRAM Data Line Error
9	SRAM Integrity Test Error
10	SRAM Low Battery Error
11	FPGA Load Error
12	Real Time Clock Low Battery Error
13	DRAM Parity Error
14	Analog Output Slot Empty
15	Calibration Table Verification Error
16	ADC Self Calibration Error
17	TRAP: Divide by Zero, or Divide Overflow
17	TRAP: Debug Trap; Hardware Breakpoint
17	TRAP: Non-Maskable Interrupt (NMI)
17	TRAP: Software Breakpoint
17	TRAP: INT0 Instruct.: Overflow Detected
17	TRAP: BOUND instruction: Range Exceeded
17	TRAP: Invalid Opcode
17	TRAP: Coprocessor Not Available
17	TRAP: Double Fault
17	TRAP: Coprocessor Segment Overrun
17	TRAP: Invalid Task State Segment
17	TRAP: Segment Not Present
17	TRAP: Stack Exception
17	TRAP: General Protection Fault
18	Printf Floating Point Error
19	FPGA PC-Card File Checksum Error
20	FPGA PC-Card File Load Error

DRAM = Dynamic Random Access Memory (the 4- or 16-MB SIMM board)
SRAM = Static Random Access Memory

Dimensional Drawings

Chassis for Primary Data Acquisition Devices and Optional Modules

- **11” x 8.5” x 1.40” Category**
  DaqBooks/100, /120, /112, /200, /216
  DBK1, DBK10, DBK23, DBK24, DBK30A,
  DBK43A, DBK50, DBK51, DBK52
  DBK53, DBK54, DBK84, DBK203, DBK204,
  TempBook/66
  WaveBook/512, WaveBook/512H
  WBK10, WBK10H, WBK10A,
  WBK14, WBK15, WBK16, WBK17

- **11” x 8.5” x 1.72” Category**
  DBK34A
  DBK70
  LogBook/300
  WaveBook/512A
  WaveBook/516, WaveBook/516A

- **11” x 14” x 3.44” Category**
  DaqBook/260
  DBK60
  LogBook/360

Dimensions for DBK Cards and Boards (excluding DBK200 Series)

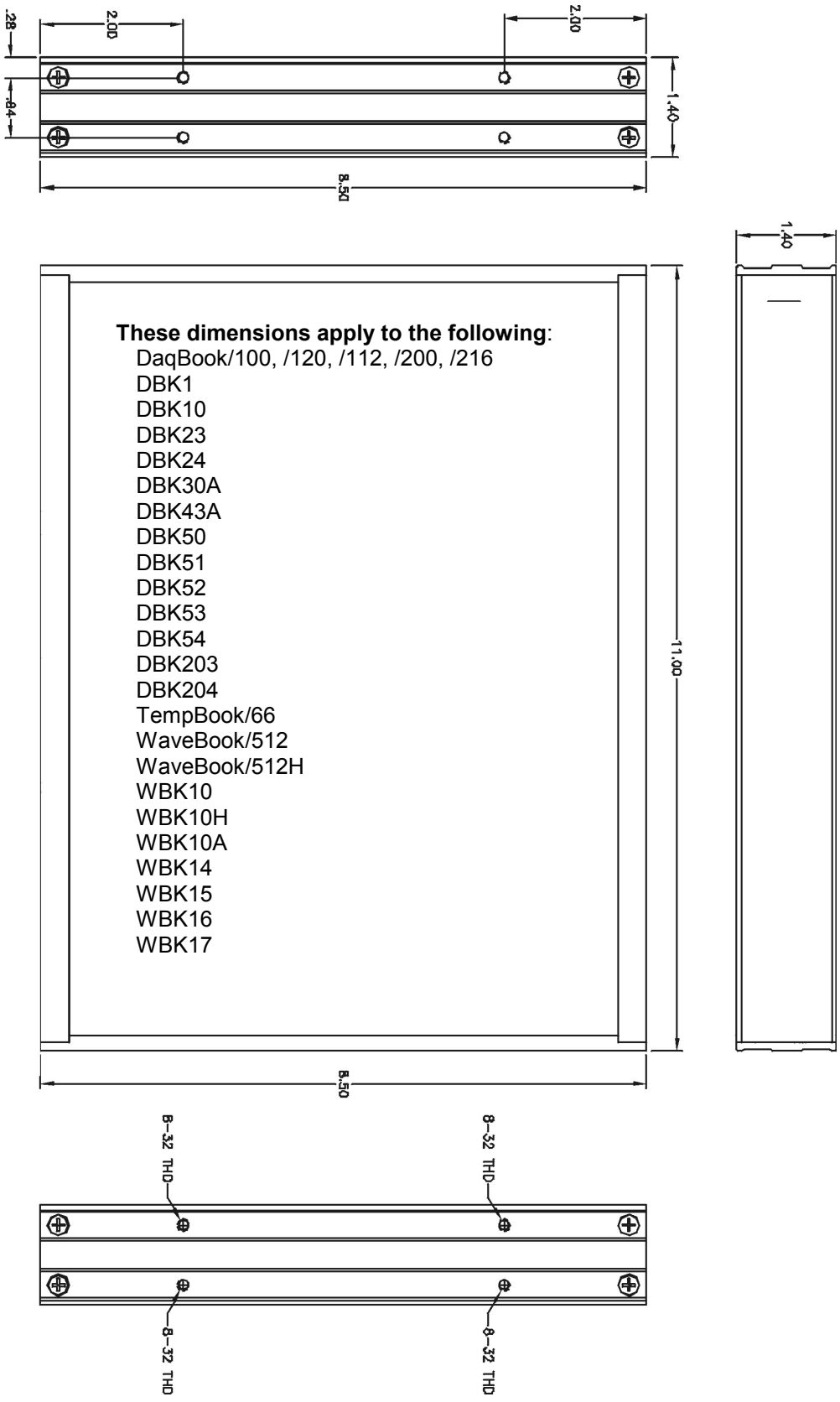
3.26” x 8.32” Category
DBK2, DBK4, DBK5, DBK7, DBK8, DBK9,
DBK11A, DBK12, DBK13, DBK15, DBK16,
DBK17, DBK18, DBK19, DBK20, DBK21,
DBK25, DBK32A, DBK33, DBK44, DBK45,
DBK81, DBK82, DBK83

Dimensions for DBK200 Series Devices

DBK200
DBK201
DBK202
DBK203 Module (See 11” x 8.5” x 1.40” Category)
DBK204 Module (See 11” x 8.5” x 1.40” Category)
DBK205
DBK206
DBK207
DBK207/CJC
DBK208
DBK209

Chassis for Primary Devices and Modules

11” x 8.5” x 1.40” Category

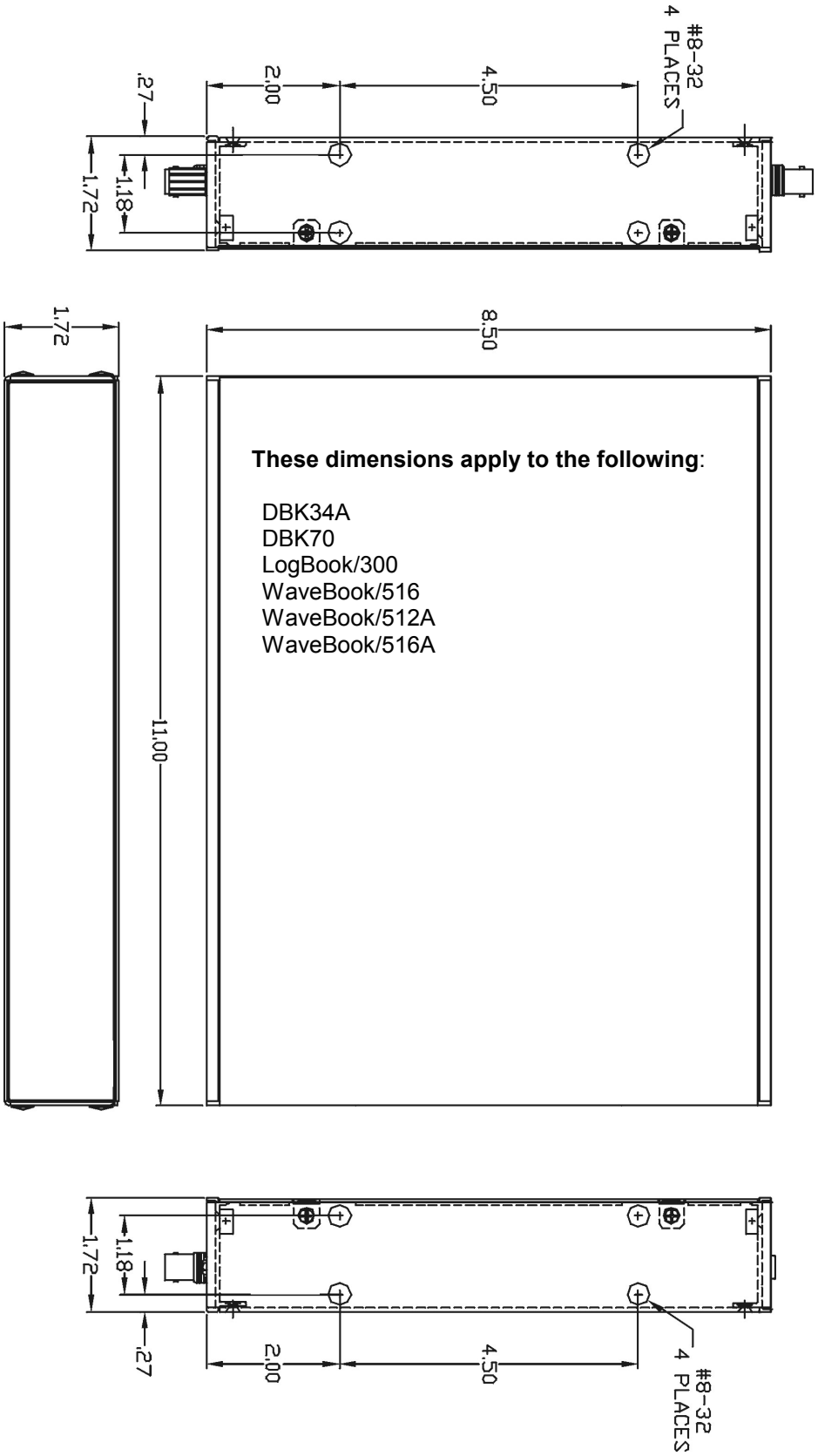


These dimensions apply to the following:

DaqBook/100, /120, /112, /200, /216
DBK1
DBK10
DBK23
DBK24
DBK30A
DBK43A
DBK50
DBK51
DBK52
DBK53
DBK54
DBK203
DBK204
TempBook/66
WaveBook/512
WaveBook/512H
WBK10
WBK10H
WBK10A
WBK14
WBK15
WBK16
WBK17

Chassis for Primary Devices and Modules

11” x 8.5” x 1.72” Category

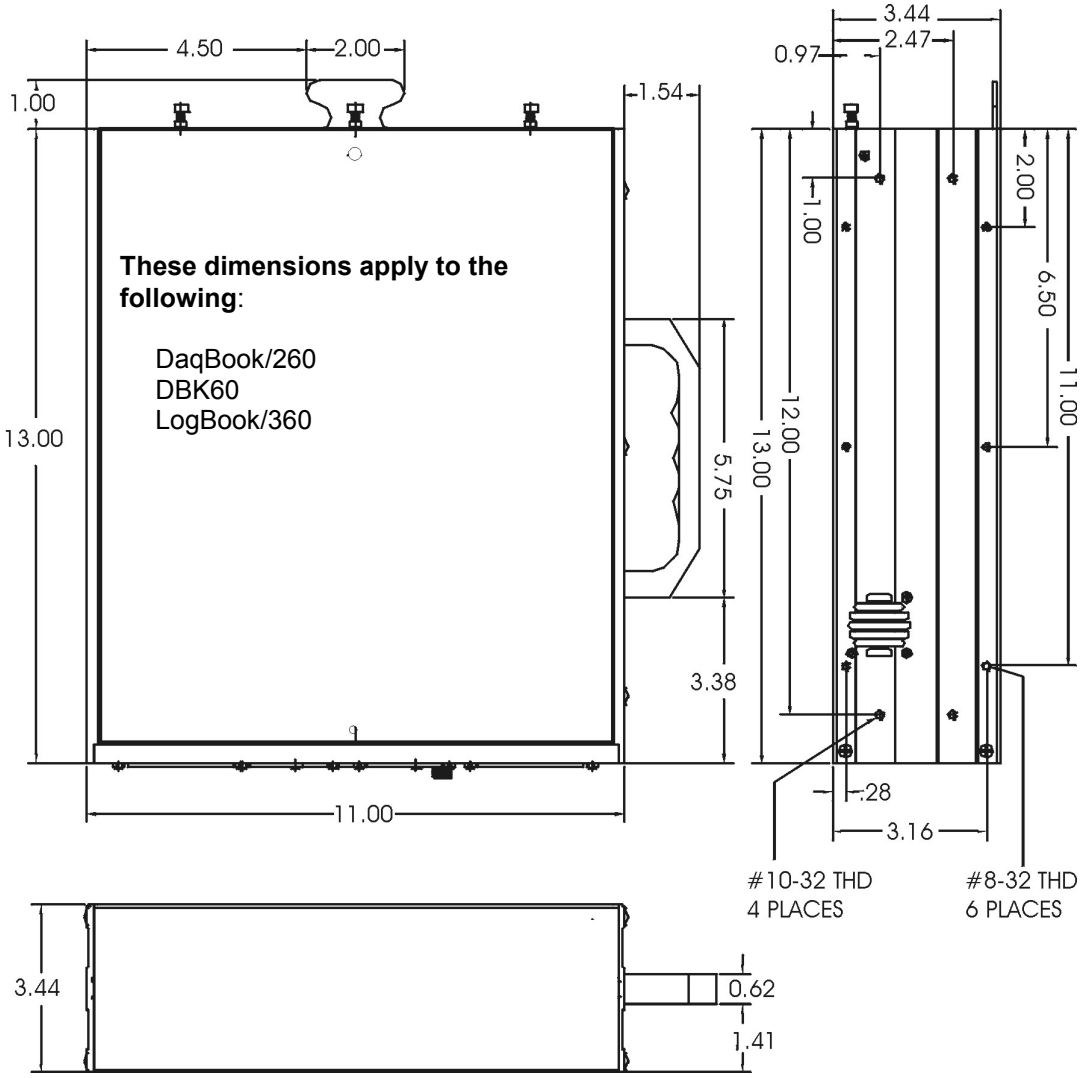


These dimensions apply to the following:

DBK34A
DBK70
LogBook/300
WaveBook/516
WaveBook/512A
WaveBook/516A

Chassis for Primary Devices and Modules

11” x 14” x 3.44” Category

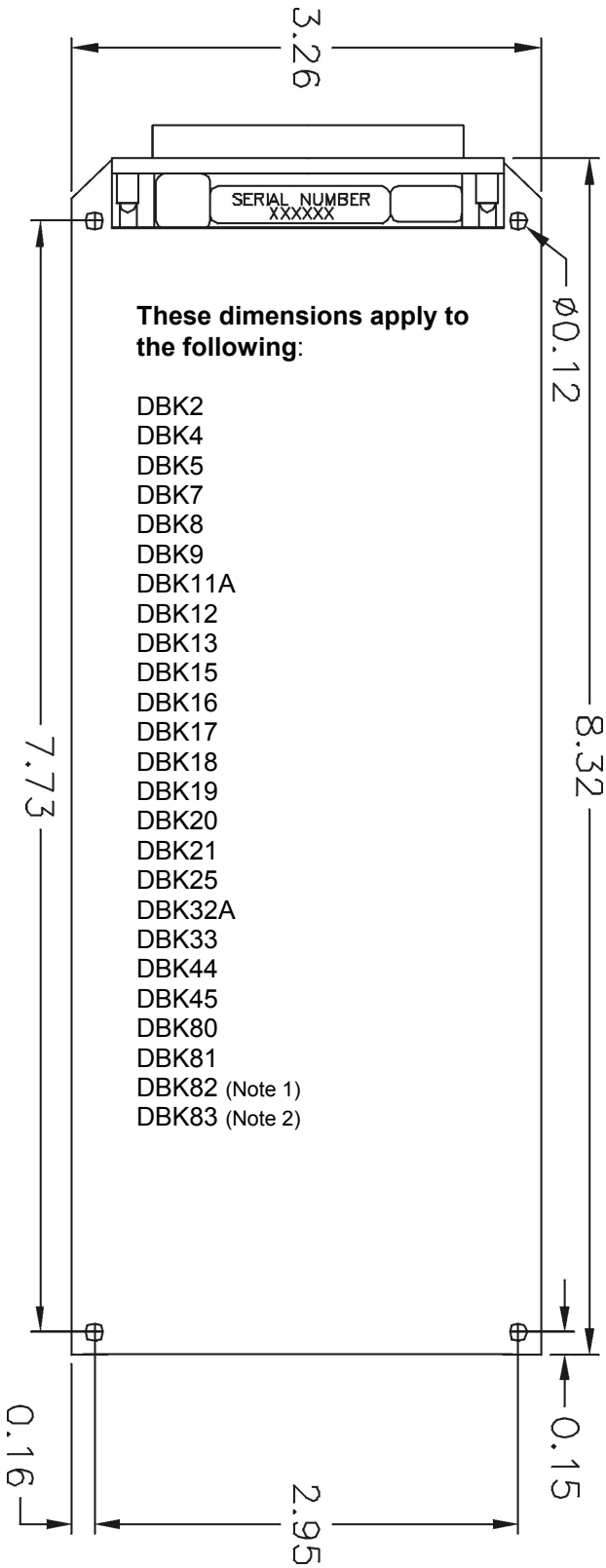


These dimensions apply to the following:

DaqBook/260
DBK60
LogBook/360

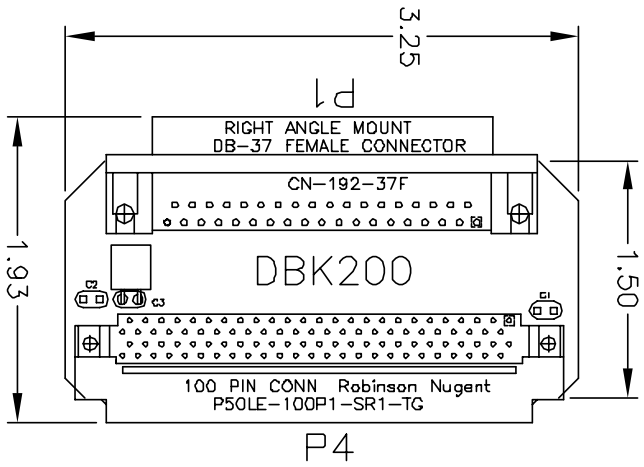
Dimensions for DBK Cards and Boards (excluding DBK200 Series)

3.26” x 8.32” Board Size Category

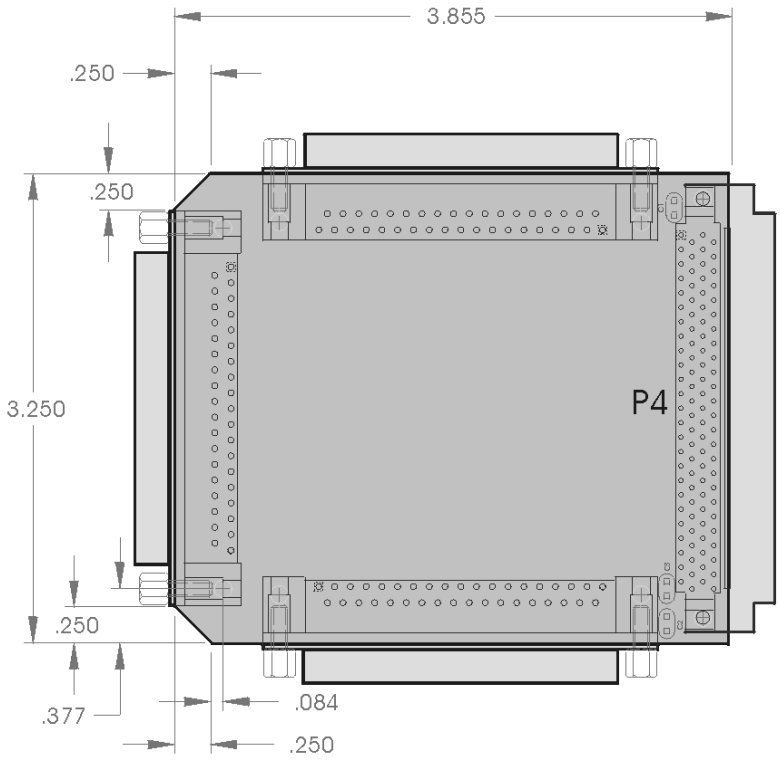


Note 1: DBK82, being significantly thicker than other boards, does not fit into 1-slot enclosures such as the DBK10 and the DaqBook/216. DBK82 does fit into DBK41 enclosures and in drawer type products such as DaqBoard/260.

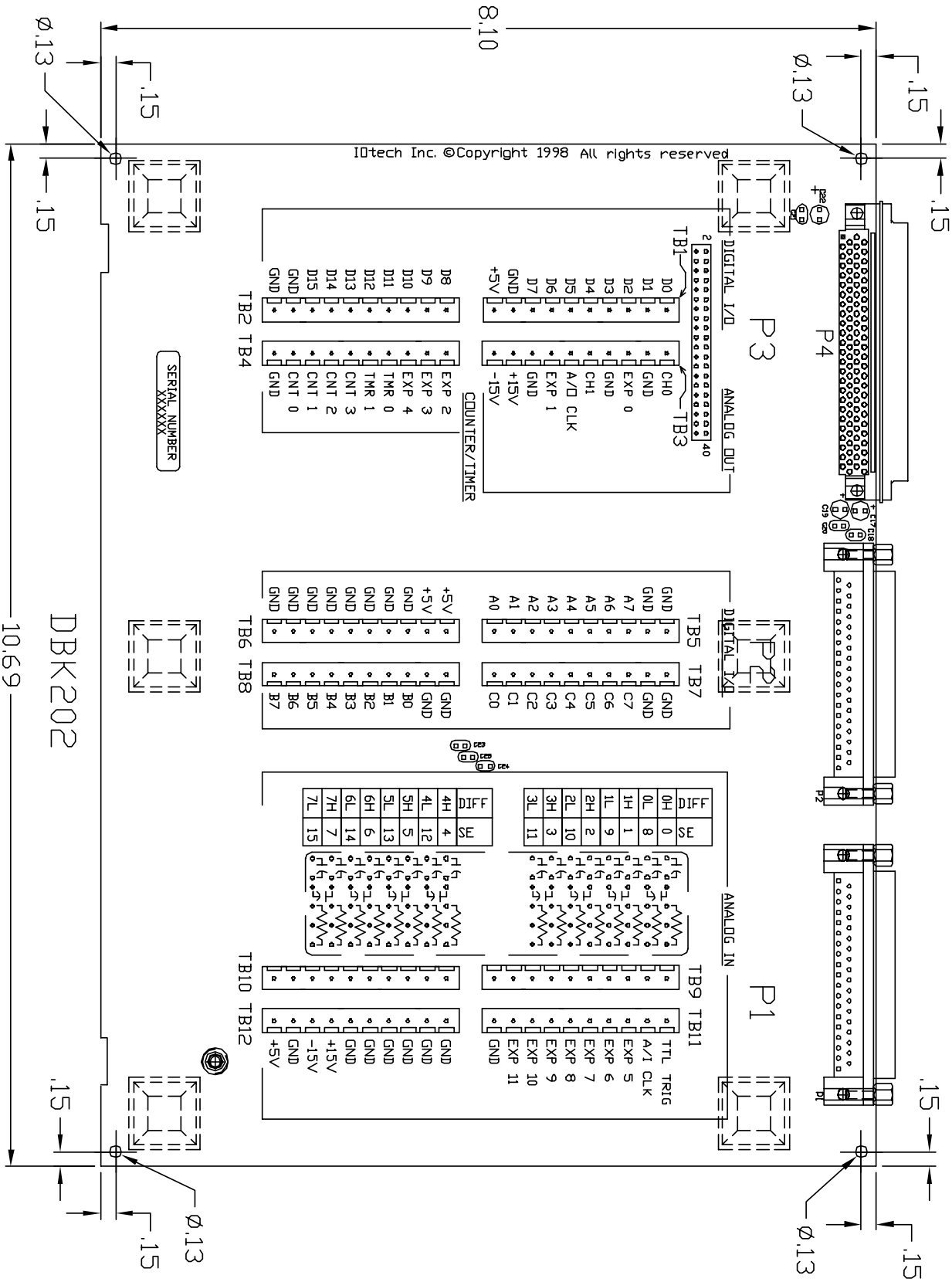
Note 2: DBK83 makes use of a an external screw-terminal connector, which is designated as POD-1.



DBK200

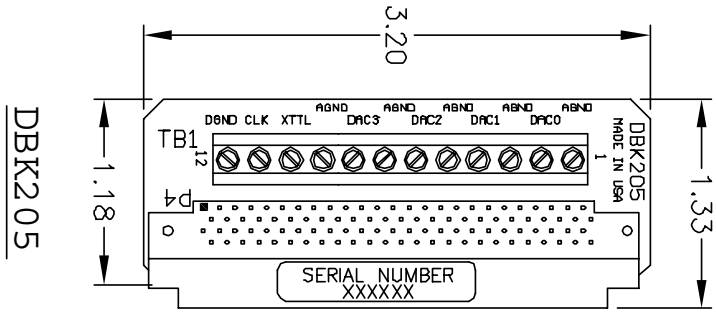


DBK201

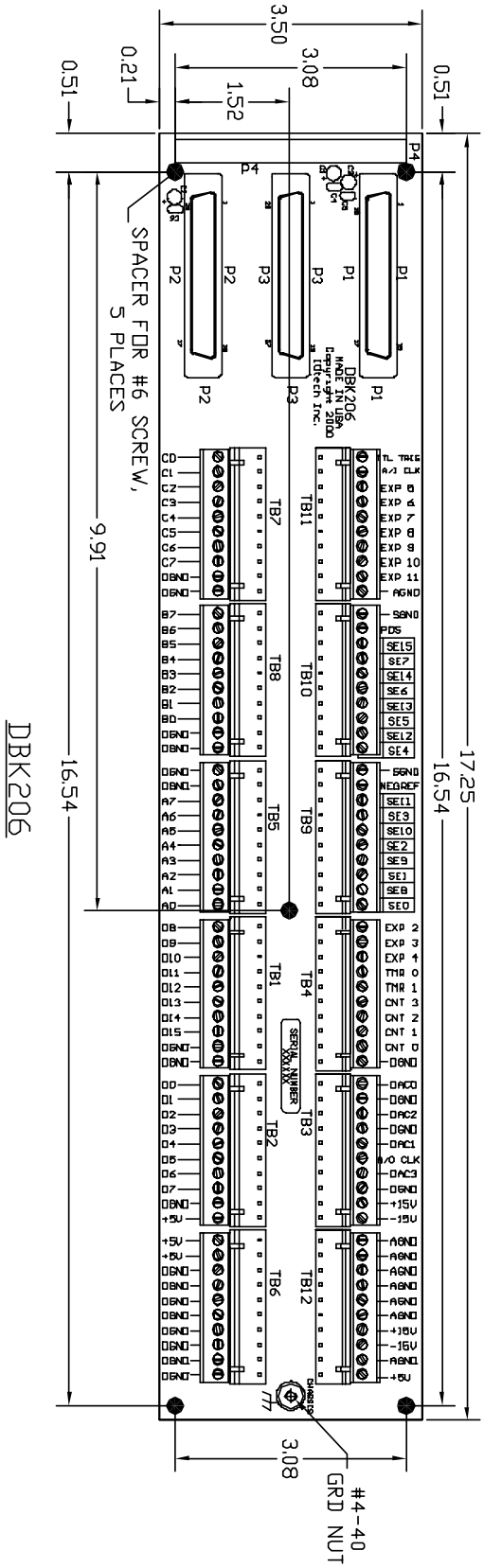


DBK202

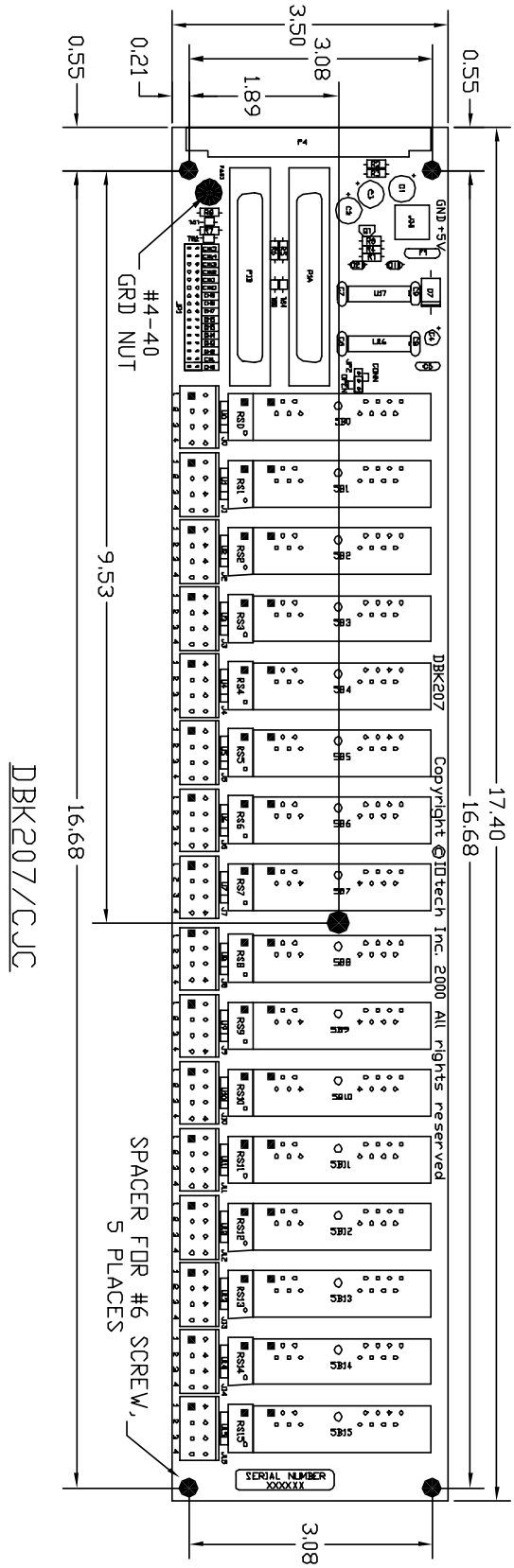
Note: DBK203 and DBK204 are modules that house a DBK202 board. Refer to the 11" x 8.5" x 1.40" category for applicable dimensions.


DBK205
3.20
1.18
1.33
AGND AGND AGND AGND AGND
DGND CLK XTTL DAC3 DAC2 DAC1 DAC0
TB1
12
1
P4
DBK205
MADE IN USA
SERIAL NUMBER
XXXXXX

DBK205

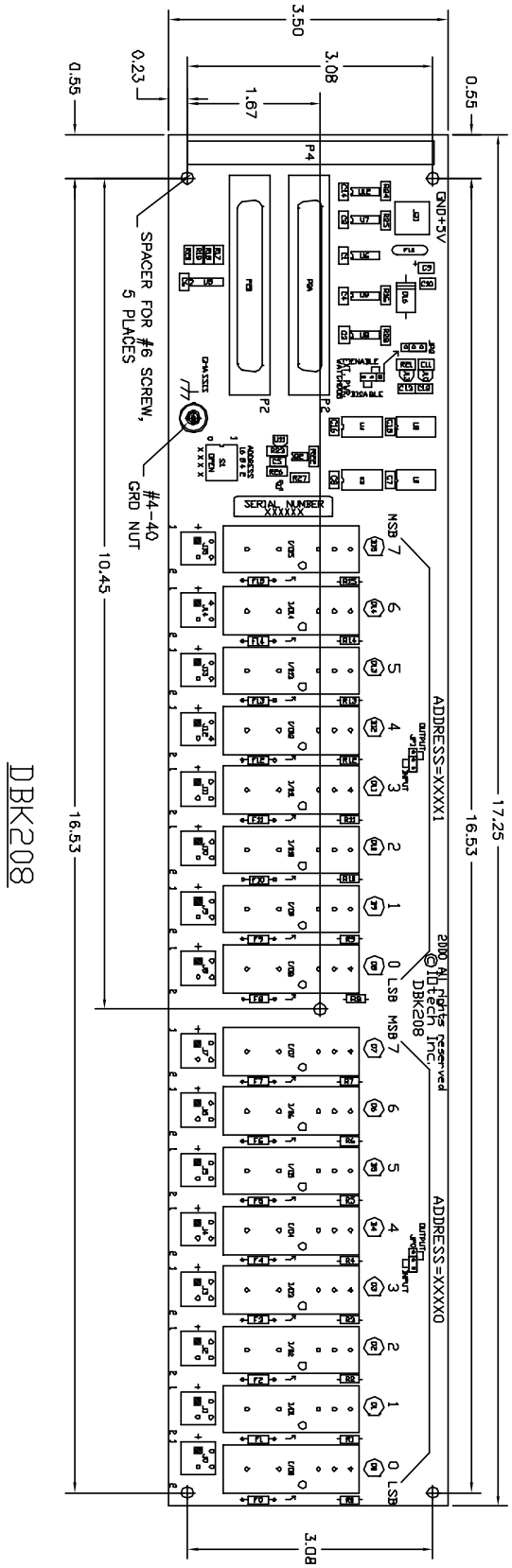

3.50
3.08
1.52
0.21
0.51
0.51
SPACER FOR #6 SCREW,
5 PLACES
9.91
16.54
17.25
16.54
3.08
#4-40
GRD NUT
DBK206
P1
P2
P3
P4
TB1
TB2
TB3
TB4
TB5
TB6
TB7
TB8
TB9
TB10
TB11
TB12

DBK206

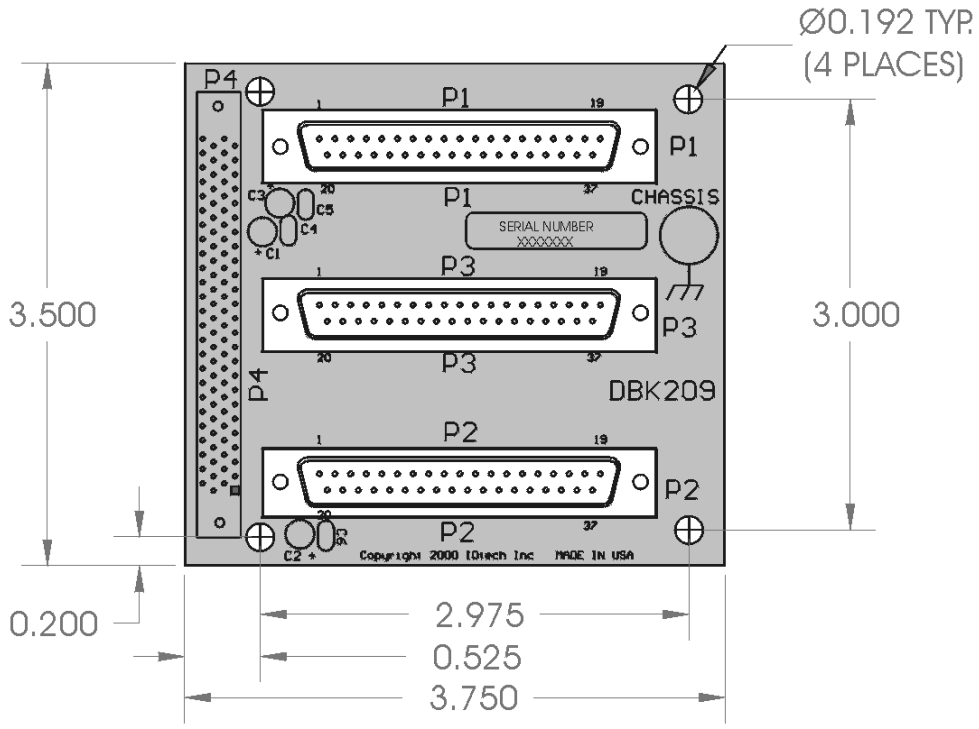


DBK207/CJC

These dimensions apply to the both the DBK207 and the DBK207/CJC.


DBK208
3.50
3.08
1.67
0.23
0.55
0.55
16.53
10.45
17.25
16.53
3.08
SPACER FOR #6 SCREW,
5 PLACES
#4-40
GRD NUT
SERIAL NUMBER
XXXXXX
ADDRESS=XXXX1
ADDRESS=XXXX0
MSB
LSB
2000 All rights reserved
Diltech Inc.
DBK208

DBK208


Ø0.192 TYP.
(4 PLACES)
P4
P1
P1
P1
CHASSIS
SERIAL NUMBER
XXXXXXX
P3
P3
P3
P4
DBK209
P2
P2
P2
Copyright 2000 IOtech Inc MADE IN USA
3.500
3.000
0.200
2.975
0.525
3.750

DBK209

Glossary

Acquisition
A collection of scans acquired at a specified rate as controlled by the sequencer.

Analog signal
A signal of varying voltage or current, resistance, temperature such as the output of a sensor. Many analog signals are in the form of sine waves.

Analog-to-Digital Converter (ADC)
A circuit or device that converts analog signals into digital values, such as binary bits, for use in digital computer processing.

Bipolar
A range of analog signals with positive and negative values (e.g., -5 to +5 V); see *unipolar*.

Buffer
Buffer refers to a circuit or device that allows a signal to pass through it, while providing isolation, or another function, without materially altering the signal. *Buffer* usually refers to:

(a) A device or circuit that allows for the temporary storage of data during data transfers. Such storage can compensate for differences in data flow rates. In a FIFO (First In - First Out) buffer, the data that is stored first is also the first data to leave the buffer.
(b) A follower stage used to drive a number of gates without overloading the preceding stage.
(c) An amplifier which accepts high source impedance input and results in low source impedance output (effectively, an impedance buffer).
(d) Buffer Amplifier (see *Buffer Amplifier*).

Buffer Amplifier
An amplifier used primarily to match two different impedance points, and isolate one stage from a succeeding stage in order to prevent an undesirable interaction between the two stages. (Also see, *Buffer*).

Channel
A single *input*, or *output* for the acquisition device. In a broader sense, an *input channel* is a signal path between the transducer at the point of measurement and the data acquisition system. A channel can go through various stages (buffers, multiplexers, or signal conditioning amplifiers and filters). Input channels are periodically sampled for readings.
An *output channel* from a device can be digital or analog. Outputs can vary in a programmed way in response to an input channel signal.

Common mode
Common mode pertains to signals that are identical in amplitude and duration; also can be used in reference to signal components.

Common mode voltage
Common mode voltage refers to a voltage magnitude (referenced to a common point) that is shared by 2 or more signals. Example: referenced to common, Signal 1 is +5 VDC and Signal 2 is +6 VDC. The common mode voltage for the two signals is +5.5 VDC [(5 + 6)/2].

Crosstalk
An undesired transfer of signals between system components or channels. Crosstalk often causes signal interference, more commonly referred to as *noise*.

Data Logger
A system that efficiently saves relatively large quantities of data to a suitable memory media.

Digital
A digital signal is one of discrete value, in contrast to a varying signal. Digital data is represented by combinations of binary digits (0s and 1s).

Digital-to-Analog Converter (DAC)
A circuit or device that converts digital values (binary bits), into analog signals.

Differential mode
The differential mode measures a voltage between 2 signal lines for a single channel. (Also see *single-ended mode*).

Differential mode voltage
Differential mode voltage refers to a voltage difference between two signals that are referenced to a common point.
Example: Signal 1 is +5 VDC referenced to common. Signal 2 is: +6 VDC referenced to common.
If the +5 VDC signal is used as the reference, the differential mode voltage is:
+1 VDC (+ 6 VDC - +5 VDC = +1VDC).

If the +6 VDC signal is used as the reference, the differential mode voltage is:
-1 VDC (+ 5 VDC - +6 VDC = -1 VDC).

DIP Switch
A group of miniature switches in a small *Dual In-line Package* (DIP). In systems where configuration can not be made through software alone, DIP switch settings or jumpers are often used to configure the hardware. In many cases a software setting that matches the hardware setting must be made. DIP switches are often used for addressing.

ESD
Electrostatic discharge (ESD) is the transfer of an electrostatic charge between bodies having different electrostatic potentials. This transfer occurs during direct contact of the bodies, or when induced by an electrostatic field. ESD energy can damage an integrated circuit (IC).

Excitation
Some transducers [e.g. strain gages, thermistors, and resistance temperature detectors (RTDs)] require a known voltage or current input in order for the sensor to operate. This known input is called the Excitation.

Gain
The degree to which a signal is amplified (or attenuated) to allow greater accuracy and resolution; can be expressed as ×n or ±dB.

Isolation
The arrangement or operation of a circuit so that signals from another circuit or device do not affect the *isolated* circuit. *Isolation* usually refers to a separation of the direct link between the signal source and the analog-to-digital converter (ADC). Isolation is necessary when measuring high common-mode voltage.

Linearization
Some transducers produce a voltage in linear proportion to the condition measured. Other transducers (e.g., thermocouples) have a nonlinear response. To convert nonlinear signals into accurate readings requires software to calibrate several points in the range used and then interpolate values between these points.

Multiplexer (MUX)
A device that selects a signal from among several signals and outputs it on a single channel.

Sample (reading)
The value of a signal observed on a channel at an instant in time. When triggered, the ADC reads the channel and converts the sampled value into a digital representation.

Scan
A series of measurements across a pre-selected sequence of channels.

Sequencer
Defines and controls the state of the measurement system for each step of a scan.

Simultaneous Sample-and-Hold
An operation that captures samples from multiple channels at the same instant in time. The result is elimination of time skew between measurement of individual channels.

Single-ended mode
Measurement of a voltage between a signal line and some reference that may be shared with other channels. (Also see *differential mode*).

Trigger
An event to start a scan or mark an instant during an acquisition. A trigger can be a TTL signal, a specified signal level, a button manually or mechanically engaged, or a software command.

TTL
Transistor-Transistor Logic (TTL) typically used to communicate logic signals where a logical 0 is defined by a voltage level of <0.8V and logical 1 is defined as 2.4-5V.

Unipolar
A range of analog signals between zero and some positive value (e.g., 0 to 10 V).