SOFTWARE INSTALLATION & DATALOGGER USER'S GUIDE

ANALYSE-PLUS & DATALOGGER CVF2

Givens Control Engineering Inc.

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Version 4

Givens Control Engineering Inc.

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License Agreement

The software is provided on CD-ROM or diskettes contained in a sealed envelope. By removing the diskettes or CD-ROM(s) from this envelope, you indicate acceptance of the following terms:

You may make a backup of the software contained on the diskettes or CD-ROM for archival purposes only. You may install the software on one computer per licence. Any other duplication of this software or of the software contained in the DataLogger enclosure is a violation of law. You may not reverse engineer, decompile, or disassemble either software. You may not reverse engineer, or copy the design of the DataLogger product, nor sell or loan the DataLogger product to persons that you know intend to do so.

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Safety Information

Although the DataLogger CVF2 offers some protection in the event of accidental connection to high voltages (see Appendix B "Specifications"), **deliberate connection of this unit (excluding the AC adapter) to voltages in excess of 50 volts represents a misuse of the DataLogger unit for which Givens Control Engineering Inc. disavows any liability whatsoever.**

Do not exceed the operating limits listed in Appendix B "Specifications".

To prevent electrical shock when high voltages are accidentally applied to the signal input terminals of the unit:

- always use the AC adapter with a 3-terminal AC electrical outlet having a functioning ground (earth).
- if the AC adapter is not in use, a cable capable of carrying at least 20 A (amperes) must be connected between the DataLogger grounding post (to the right of the carrying handle) and a functioning electrical ground (earth). The grounding post is identified on the unit by the symbol at left.
- check that voltages present at the input terminal blocks are not hazardous before touching the connected signal wires or the input terminals directly, and before making contact through an electrically conductive device such as a metal screw driver.
- never exceed the operating limits listed in Appendix B "Specifications". This can damage the unit and expose the operator to a shock hazard.
- if the over-voltage or isolation voltage limits given in Appendix B "Specifications" were exceeded or if the unit is malfunctioning in any way, the unit must be immediately disconnected from any source of electrical voltage and must not be used again until it has been returned to Givens Control Engineering Inc. for repair.
- do not operate the unit in explosive atmospheres.
- do not immerse the unit in liquids nor splash liquids upon it.
- do not remove the cover of the unit nor disassemble the unit. There are no user-serviceable parts inside.
- do not expose the unit to extreme heat or substantial mechanical damage, which could cause the Lithium-Ion or Lead-Acid gel battery in the unit, containing corrosive substances, to leak.
- do not dispose of the unit by combustion because the internal battery may explode when exposed to extreme heat.
- provide at least 8 cm (3 inches) of air space on all four sides and the top of the unit for proper ventilation.
- follow proper operating procedures as described in this manual, to

avoid possible hazardous situations.

Safety Symbols

The symbol at left indicates that the operator must refer to an explanation in this manual.

The symbol at left indicates a protective conductor terminal (grounding / earth post) to be connected to an electrical ground (earth) if the AC adapter is improperly grounded or is not in use.

Regulatory Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

This equipment is intended for use in an industrial/commercial environment only.

Changes or modifications to the equipment not expressly approved by Givens Control Engineering Inc. could void the user's authority to operate the equipment.

Cet appareil numérique de la classe A respecte toutes les exigencies du Réglement sur le matérial brouilleur du Canada.

About This Manual

This manual contains information concerning the installation of the Analyse-Plus software and first use of the DataLogger CVF2. **Detailed information concerning usage of the software is contained in the On-Line Help**. To access this, click the **Help** button on any display or press the F1 key. Once you have installed the software and have become comfortable with the hardware, you should use the On-Line Help as your main source of information.

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1 Getting Started

Thank you for purchasing Analyse-Plus and optionally the DataLogger CVF2 data acquisition unit. The DataLogger CVF2 is designed and manufactured by Givens Control Engineering Inc. . Analyse-Plus was created by Givens Control Engineering Inc.

What's New

New in Version 4.00

General

V4.00 is now a fully 32-bit multi-threaded application and runs under Windows 95/98/ME/NT4/2000/XP/Vista. The driver was completely rewritten from scratch so it can communicate with the Data Logger CVF2 under all of these operating systems. It consumes less of your CPU's (processor's) resources (execution time) to run.

Plots, importing, DDE, capturing the plot image and data collection have all been improved.

Long filenames are supported.

Your serial number for Analyse-Plus now contains information to enable or disable optional features or to allow usage of options for a trial period (e.g. 30 days). Technical Support can do this merely by emailing you a new number. Software validation prevents fraud without the use of a dongle.

Data Collection With The Data Logger CVF2

An anti-aliasing digital filter has been added to the firmware in the Data Logger CVF2 (DL). Virtually any choice of filter time constant (including zero) is possible. The value is entered as a ratio to the sample period so that it doesn't need to be updated every time the sample period is changed.

The DL can now perform *pre-triggered* collections (in addition to post-triggered and not triggered available in V3). This means that you can configure the DL to collect for x seconds/minutes/hours *before* a specific set of conditions occurs that interests you. For example, you could set the

DL to wait for a specific upset in a pressure to occur but to collect and save the sampled data starting 30 sec before that event so that you could determine the cause. The criteria are checked 1000 times/sec. Pre-Triggering can be done in stand-alone mode to allow you to disconnect your PC and leave the DL to check for the event of interest. The Pre-Trigger Advance time is subject to available RAM in the DL.

If the serial number of your DL is 1114377 or greater, your DL has 512K RAM rather than the traditional 256K RAM. But the firmware only recognized 256K. Version 4 will automatically upgrade the DL's firmware stored in EEPROM to allow the above features and to enable the extra memory. This allows longer stand-alone collections (with your PC disconnected and removed) and longer Pre-Trigger Advance times.

When the DL is waiting for the Pre-Trigger or Post-Trigger criteria to be met, the green "COL" LED now flashes. When counting down the post-trigger delay, it flashes at a faster rate. When collecting data, it stays lit. In all previous versions, it stayed lit for all 3 conditions.

Comments can be entered at any time during a collection. They are saved in the data file and log file when the collection ends or the maximum file size reached. Under V3, they were saved at the beginning of collection and could not be edited during a collection.

The maximum file size has been increased from 150,000 to 250,000 samples per channel. (Data collections up to 4.27 billion samples/channel can still be configured but will be spread across several files).

When connecting to the Data Logger (DL), the Windows print queue is checked to see if the parallel port is in use. This is more reliable than the old method, which used hardware.

An IRQ (Interrupt Request) for the parallel port is no longer required. This eliminates one of the principal causes of communication errors.

The range and status pull-down lists are now initialized to agree with the current selection rather than the top-most choice.

Collection Plot

The Collection Plot now sizes & shifts itself for video resolutions greater than 800 X 600 to use the entire screen.

The y-axis scale precision is set individually for each channel according to the magnitude of the values at any time. In V3, they were fixed at 3.

Overlay and Separate Plots & Printing
The plot setup window has been redesigned. You can clear all settings and move file names/Tags up and down to allow insertion of one file between others. New plot statistics have been added.

The statistics can be toggled to apply to the whole file like in V3 or to the viewed region. For example, part of a file may represent one condition (e.g. auto) while another may represent another (e.g. manual). You can easily compare the statistics of any region (e.g. 2-sigma) merely by zooming to it.

Three new options for displaying Fourier plots were added. You may choose to have the x-axis linear with respect to period or frequency (in V3, it was always linear with respect to frequency). You may display the "intensity" of each frequency/period as power or as amplitude on the y-axis (like variance VS sigma). In V3, it was always amplitude. When power is selected, scientific notation is used (e.g. 1.1 E-3). The value can be displayed as a vertical bar like in V3 or the dots can be connected like in a Time Series plot to provide a different visual effect.

You can now copy the printable image (like a "clean-screen") to the clipboard or save it as a graphics file to BMP, PNG, or JPEG format or hold it to allow capturing using your own method. PNG files are very compact without loss and are ideal for reports, emailing etc. and are compatible with word processors, email and web browsers etc. Various color-depth settings are allowed.

You can now copy the data from any plot including the analysis plots (cross/auto correlation, Fourier, etc.) to the clipboard as text to allow pasting to any application. You can choose which plot, whether to send the entire plot's data or just the viewed portion, period, frequency/time index etc.

When printing, a print dialog box is displayed so you can select the number of copies etc..

In V3, you could only print to the default printer and a proper Disconnection with the Data Logger (DL) would occur if the default printer used the parallel port to which the DL was connected. Now, you may choose the printer so you can print to a network or USB port or use the print-thru port to print to a printer connected to the parallel port. Analyse-Plus will check what printers are available that do / do not use the port.

The up/down buttons of the cursor diamond now move the cursor from one trace to another (in V3, they had no function).

Overlay Plot/Print
You can now override the scaling of each plot relative to the others. For example, you can set several traces to have the same span on the monitor in engineering units rather than individual auto-scaling. This allows you to visually compare variability. The span, offset and overlay of plots can be set independently, for example, to plot the setpoint of a loop on top of the measured value.

The spacing between legend items in the printout was reduced and statistics were moved so that all 10 items in the legend are printed. All 10 statistics and y-axis labels are also printed (V3 would only show the 5 items that you selected to be visible).

You can now toggle between displaying the Tag, Status and Units VS the Descriptions. Descriptions are more useful when presenting plots to a wider audience who may not know the Tag numbers.

The y-axis labels are now dynamically positioned to centre them with respect to the tick marks regardless of the number of traces present.

The Overlay Plot now sizes & shifts itself for video resolutions greater than 800 X 600 to use the entire screen.

Switching the legend from Plots 1-5 to 6-10 and back is now much faster.

Separate Plot/Print
The Separate Plot now sizes & shifts itself for video resolutions greater than 800 X 600 to use the entire screen.

The height of each plot (displayed or printed) has been increased up to 11 % for the same video resolution.

The x-axis scale of auto-correlation and cross-correlation plots has been changed from lags to time units (msec/sec/minutes etc.) to make them easier to use.

Importing ASCII (Text)
Much wider files (more columns) can now be imported.

The date and time when the data contained in the text file was collected can be entered once during importation and applied to all variables imported. The date and time defaults to the date and time of the text file. In V3, each data file (one per variable) had to be edited to set the correct date & time.

Import handles files containing lines that end with line feeds (LF) or carriage returns (CR) only. These are typically created in other operating systems such as QNX, Unix, etc.

DDE
Larger files can be sent via DDE. You can send the data in chunks by entering the first and last sample number to be sent or, if sending to a spreadsheet program, DDE Send can automatically do this, updating cell & row numbers automatically for each chunk.

Additional items have been added to DDE Send such as the comments, signal (mV/mA/Hz) and Engineering Units scaling values etc.

Importing For Bailey (CLS)
This is a new optional feature available at extra cost. It imports a Bailey CLS (text) file while parsing your *template* file to obtain Tag, Description, Units, variable type info etc. It checks for collection errors and replaces them. It checks for multiple breaks in the data collection, finds the collection date and time and updates it for all 24 files. It suggests filenames for all 24 variables based on their Tags and the method you specify. It works on Windows/DOS/QNX CLS files. Contact sales@givenscontrol.com for more information.

Save and Export
File sizes are now displayed in terms of the number of samples instead of bytes. This is consistent with Analyse-Plus in general.

Miscellaneous
The Quick List now displays the number of files in it. The maximum number of files has been increased from 200 to 300.

Analyse-Plus is now distributed on CD-ROM.

The default window and plot colours have been updated to make them more distinguishable.

Seconds are included in the display of collection time where space permits (use 24 hr format).

When exiting, the number of unsaved files is displayed as a warning.

New in Version 3.00

The entire application has been rewritten from scratch. Many new features have been added including handling of up to 200 files at a time, improved plotting, zooming, DDE, auto and cross-correlation plots,

collection of an unlimited number of samples by continuous streaming to disk, better memory management in the DataLogger and more. Search for *DOS* in the On-Line Help for the most important changes to features that existed in the previous DOS version.

DataLogger CVF2 Features

The DataLogger CVF2 represents a new development in data acquisition technology — the combination of portability and industrial robustness. Here are some of the principal features:

- Input signals are isolated to 1500 VDC. Over-voltage protection is 300 VDC.
- Portability, Light weight: 5 lb/2.5 Kg.
- Plugs into your PC or PS/2 parallel (printer) port.
- No plug-in card required.
- High resolution 16 bit A/D.
- Microprocessor-based with built-in memory.
- Print-thru port — print while connected to the DataLogger.
- Battery backup and automatic charging allows operation for 10 hours on a fully charged battery for units with a Li-Ion battery.
- 8 differential analog input channels, 1 frequency channel.
- 9 analog input ranges: 0 to 20 mA, 0 to 10 V, 0 to 2 V, 0 to 500 mV, 0 to 100 mV, -5 to 5 V, -1 to 1 V, -250 to 250 mV, -50 to 50 mV.
- Built-in anti-aliasing hardware filter for analog channels.
- Built-in anti-aliasing digital (software) filter for analog channels.
- 0 to 30 KHz frequency channel range with 2 trigger levels.
- All analog ranges and frequency trigger levels are software selectable. No jumpers or switches.
- 10 KHz sampling frequency — 1000 samples/second per channel to 1 sample/minute per channel.
- Stand-alone collection mode. After data collection is initiated from your computer, collection will continue with or without a computer connected. Data can be retrieved later from memory.
- Advanced collection post-triggering on any channel with configurable delay.
- Advanced collection pre-triggering on any channel with configurable advance.
- Continuous data collection (streaming to disk).
- Full-featured data collection and time series analysis software included. Software runs under Windows 98, 95, ME, NT4, 2000, XP or Vista. See *Computer System Requirements* 3 pages ahead.
- Included software provides plotting, Fourier analysis (frequency spectrum), auto & cross-correlation, import and export capability for sampled data (to use in other applications), tag database record, collection log file record, editing, filtering and math functions, copy

graphic image or textual data to clipboard, export graphic image to graphics file.

The isolation of signal inputs is intended as a safety feature to protect the user and equipment from the accidental application of over-voltage. The isolation and over-voltage features of this product are not intended to protect against the deliberate application of extreme voltages, such as those above 50 V.

About This Book

Before you install the software and power up the DataLogger, you should spend a moment to understand the format and conventions used in this manual.

This manual is written in a tutorial format but can be used as a reference also.

Short Forms

DL is a short form for DataLogger, both in this manual and in the software.

Text Conventions

Specific text that you should type as written or appears explicitly in the displays is printed in bold. For example, if this manual says to type **example**, you should type the letters "example".

A placeholder for text ("fill-in-the-blanks") is printed in italics. For example, when this manual says to type *filename*.**CSD**, you should type the name of a file followed by ".CSD".

Commonly Used Words

Collection is the process of sampling voltage, current or frequency signals and converting the samples to numbers.

Frequency when in reference to an input signal, refers to the number of voltage cycles per second. The short form for cycles/sec is *Hz.* When in reference to sampling speed, it is the number of samples taken per second. In common usage, the short form for this is also Hz. To avoid confusion, samples/sec or the sampling period in msec (milliseconds) is used in this manual instead.

Period is the arithmetic inverse of frequency. If the frequency of a signal is *x* Hz, then its period is 1/*x* seconds. If the sampling frequency (or rate) is *x* samples/sec then the sampling period is 1/*x* seconds. Sampling period is written in terms of msec throughout this manual and the software.

Special Information for Windows NT/2000/XP/Vista Users

The software runs under Windows 95, 98, ME, NT, 2000, XP & Vista (32 bit). The symbol at left indicates special information for Windows NT, 2000, XP or Vista users.

Checking Your Package

Take time now to check that you have received everything you should. If you purchased the DataLogger CVF2, you should have:

- 1 DataLogger (with battery unit built-in),
- 1 AC Adapter - 115 Volt,
- 1 Parallel communication cable,
- 1 CD-ROM containing Analyse-Plus,
- 1 User's Guide (this manual),
- 1 optional DC power connector if you ordered it.

If you only purchased Analyse Plus, or if you purchased a software upgrade to the DataLogger Collection & Analysis software, you should have:

- 1 CD-ROM containing Analyse-Plus,
- 1 User's Guide (this manual),

An upgrade from Version 2.0x (DOS) to 3.0x (Windows) or from 3.0x to 4.0x includes an upgrade to the DataLogger's internal software (*firmware*) that resides on an EEPROM. Analyse-Plus will automatically detect that the firmware needs upgrading and will automatically perform this upgrade. Analyse-Plus will notify you that this will happen and provide instructions to you. This will be done when you first Connect to the DL after installing Analyse-Plus.

If you have purchased any optional software add-ons, they will be included on the CD-ROM and automatically installed. If anything is missing, please email Technical Support immediately. The address is located in Appendix A.

Late-Breaking Information

Update information and errata that could not be included in the manual at the last printing is included in the README.TXT file. This is a text (ASCII) file included on the CD-ROM. You should examine this file using a text viewer or editor before installing the software in case there is

information that applies to you.

This file will be copied to your hard disk by the installation program for future reference.

Computer System Requirements

To run Analyse-Plus, you need at least a Pentium 200 MHz PC running Windows 95, 98 or ME with 32 MB RAM memory or under Windows NT4, 2000 or XP with 64 MB RAM memory or Vista with 512 MB and 30 MB free hard disk space. Only 32 bit versions of XP & Vista are supported. Your video card resolution must be set to a minimum of 800 X 600 pixels. If set to a lower resolution (e.g. 640 X 480), the displays will not fit on the screen.

Your parallel port no longer needs to support interrupts. The surest setting for your parallel port is *Standard Port. ECP* or *Enhanced* usually are compatible. *Bi-directional* may or may not. On most computers, you can change this with the *computer manufacturer's* setup program in Windows.

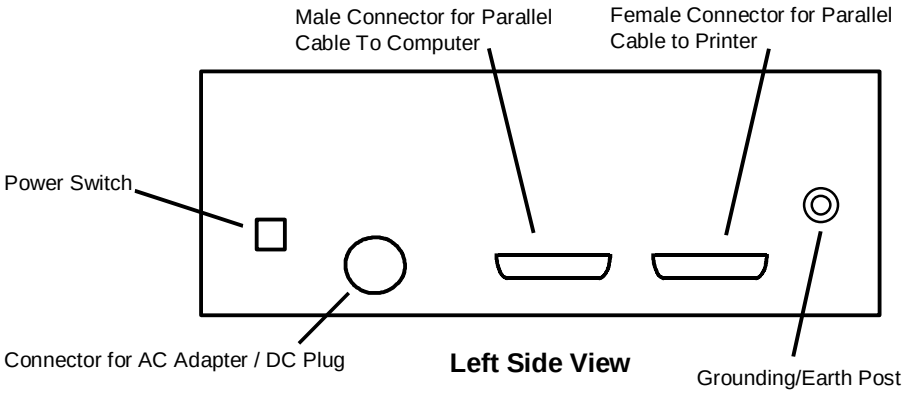
Windows Setup

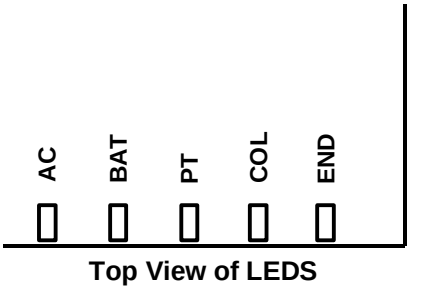
You may find that the bottoms of graphs are easier to see if you set the Windows Taskbar to "floating". To do this, click on the Windows **Start** button, click **Settings** and **Taskbar & Start Menu.** Turn on the check-boxes named **Always on top** and **Auto hide.**

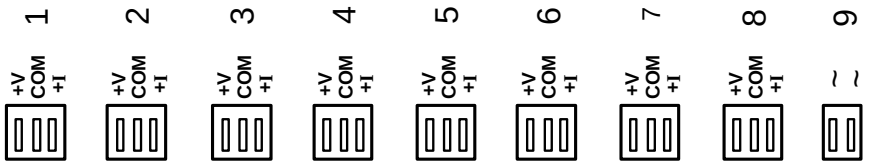
Connecting the DataLogger

Users who purchased a DataLogger (DL) do not need to have it connected to install the software. However, the DL requires about 10 minutes to reach constant operating temperature (warm-up), so it's best to connect it and power it on now. Also, it may be required when Analyse-Plus is first run after installation to upgrade the DL's own internal software that resides on an EEPROM.

The following diagrams illustrate the physical layout of the DL and its connections:







Rear View of Terminal Block

The LEDS on the DL have the following meanings:

AC - on when AC power is supplied (from the adapter) if the power switch is on;

BAT - on when the DL is powered from the internal or external battery, flashing when the battery is almost exhausted and no AC power is connected;

PT - on when the print-thru port to the printer is selected and ready for use. You can print through the print-thru port at this time;

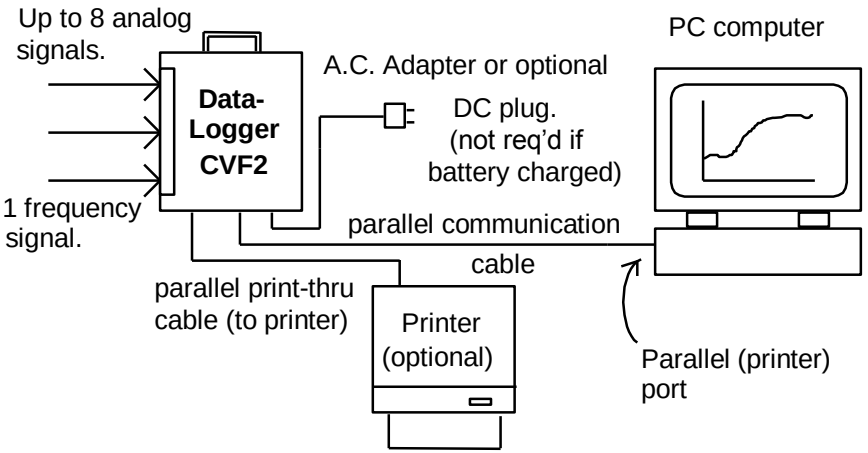
Communication between the DL and the computer is not active;

COL- will flash once per second while waiting for the Trigger Criteria to be met, and 4 times per second when counting down the Post-Trigger Delay. Once collection of sampled data actually starts, it will stay on;

END-on when the DL has finished collecting (is not collecting now but has completed a collection since being powered on).

If you are using the DL with a portable or laptop computer, you may wish to place the computer on top of the DL. The DL is roughly the same length and width as most portable computers. A comfortable arrangement is to place the DL with the LEDS facing you, the terminal block at the back of the computer and the cable connections at the left of the computer.

This diagram indicates how to connect the DL to your computer:



*An external DC supply can power the DL. To connect this, you **must** purchase the optional DC plug specially designed for this purpose. It plugs into the same jack as does the AC adapter.*

1) To connect and power on the DL, do the following:
2) Turn off your computer and printer.
3) If a printer is connected to the only parallel port of your computer, disconnect the printer cable from that port.
4) Connect the male end of the supplied parallel communication cable to your parallel (printer) port of your computer. The parallel port is always a "D" shaped female 25 pin connector. The male end of the cable is the end having the pins extending out of the connector.
5) Connect the female end of the supplied parallel communication cable to the connector on the DL labelled "To Computer". There is only one connector that will accept it.
6) If a printer is available, connect the printer cable to the DL. This cable normally connects the printer to the computer. Now it will

connect the printer to the DL. The DL connector is labelled "Print-thru". There is only one connector that will accept it.

7) Power on your computer and allow it to boot (start).
8) Plug the end of the supplied AC adapter into the DL. Plug the AC adapter into a standard AC wall outlet. Note that the AC adapter is normally 115 VAC unless you specifically requested 220 VAC. The adapter is labelled to indicate which type it is. It is recommended that you always plug the AC adapter into a 3-prong (grounded) AC outlet. **Note: if the AC adapter is not in use (when the battery is fully charged or the plug for an external DC supply is used), a cable capable of carrying at least 20 A (amperes) must be connected between the DataLogger grounding post (to the right of the carrying handle) and a functioning electrical ground (earth).**
9) Power on the DL.
10) Power on the printer. The printer is optional at this point.
11) Check that the **AC** LED on the DL is illuminated. If not, check that you have correctly connected both ends of the AC adapter and that the AC outlet has power. If the LED still fails to illuminate, call Technical Support. See Appendix A.

The "AC Power" LED will not illuminate if the DL is operating on its internal battery or an external 12 VDC source.

Your DL is now running. You do not need to connect your analog and frequency signals at this point. The next step is to install the software.

Installing the Software

You cannot manually install the software - you must run SETUP from the CD-ROM.

Before proceeding, please check that your computer meets the "Computer System Requirements" listed previously in this section. **Note the video resolution requirements.**

To install the software, insert the CD-ROM into the computer's CD-ROM drive, click the Windows **Start** button, click **Run** and enter the following:
d:\setup.exe
where **d** is the drive letter of the CD-ROM. Then click **OK**.

Follow the prompts for the installation drive/directory. If you are upgrading, you should install the new version in a new directory. The new version will read all file formats of all previous versions except Fourier Files. When you first run the new version after installing, your hard drive(s) will be searched for any older versions. If one is found, you will be asked if you wish to move the Tag Data Base File, Log File, and data files (.CSD) to the new location. For example, if the old location was C:\APLUS300\DATA and you installed to C:\APLUS400, then you'll be asked if you wish to move them to C:\APLUS400\DATA. The new version will be able to read data files from the older versions whether or not you decide to move them — moving them is only for your

own convenience.

Note that the older version may not be able to read files from the newer version. For example, the DOS version 2.0x will not read files created by the Windows version 3.00 but versions 3.00 and 4.00 can read each other's files. Also, Versions 3.00 and 4.00 will upgrade the DataLogger's (DL) internal software (on EEPROM) — earlier versions will no longer communicate properly with the DL.

Note that Versions 3.00 and 4.00 will upgrade the DataLogger's (DL) internal software (on EEPROM) so earlier versions will no longer communicate properly with the DL.

The installation drive should have at least 30 MB free — more if you plan to perform many collections unless you keep the data files on another drive.

After installation is complete, click on the Analyse-Plus icon in the DataLogger for Windows program group. **Before doing so, if you are using a portable computer, make sure you have AC power connected and all power saving features are turned off. Otherwise, the calculation concerning your computer's speed will be affected!**

You will be asked to enter your name, your company's name and a 3 letter short form for your company name or work area. The latter is used to generate the default name of your Log File Path & Name, Tag Database File and the prefix part of your Data File Name Prefix/Suffix. In each case, the first three letters of these filenames will be the short form you entered. You can change any or all of them at any time after installation is complete. You must also enter your Analyse-Plus serial number found on the CD-ROM or its case and you must agree to the terms if you wish to proceed with installation.

After you enter these values, your hard drive will be searched for older versions. If any are found, you will be informed and the configuration information of the older version will be read.

If you had installed the current version over (in the same directory as) the older version, then the installation is complete. If not, you will be asked if you wish to move the Tag Data Base File, Log File, and data files (.CSD) to the new location (as mentioned above). Analyse-Plus will be able to read data files from the older versions whether or not you decide to move them — moving them is only for your own convenience. Moving the Tag Data Base & Log files is highly recommended.

Connecting To The DataLogger For The First Time And Performing A DataLogger EEPROM Upgrade

If you purchased Analyse Plus (without a DataLogger), you may skip this entire section. If you are using the software for a trial period (typically 30 days) without the DataLogger, this section is applicable although the physical DL is simulated.

If you do not have a built-in parallel port, you may purchase one. Our web site (www.givenscontrol.com/no_pport.htm) provides detailed options.

Click the **Connect** button on the centre of the main display. If communication is established, this message will be displayed: *Communication has been established. The serial number of the DataLogger is xxxx.*
where xxxx is the actual serial number. (This number is also stamped on the bottom of the DataLogger). The firmware (software) version number, amount of RAM and how many samples can fit in the RAM are also displayed. If this occurs, skip the following section as your firmware has already been updated. If the word *simulated* appears, your DL is being simulated and no communication through the parallel port will be attempted.

If Communication With The DataLogger Is Not Working

If you are using a Quatech SPPXP-100 Express Card parallel port, Windows or its driver does some "checking" or "initialization" for approx. 10 sec after the card is inserted into the PC. When this is happening, communication with the DL will be disrupted if attempted. If the DL is connected, the PT Led will flash during this interval. Wait until the flashing stops before clicking **Connect**.

The most common reason for this is that the portable computer's AC power was not connected or power- saving features were running when you first ran Analyse-Plus, causing an erroneous CPU speed calculation or that the parallel port type is not set to a compatible type.

To correct the former, click the menu selections **Options / Communication Settings** and click **Recalculate**. Click **OK** and **Connect** again. If this does not solve the problem, use the Help topic *Trouble Shooting* to direct you to a solution. In some cases, you may need to exit the software, change the parallel port settings through a manufacturer's configuration program or from BIOS (when booting the computer) to *Standard Port*.

Upgrading the DataLogger's EEPROM Software

Using the DL's firmware (software) number obtained when communication was initiated, Analyse-Plus will determine if the firmware, stored in its EEPROM, needs to be upgraded. If you are not upgrading Analyse-Plus, this will not occur. An upgrade from any version to Versions 3.0x or 4.0x requires an upgrade to the DL's software.

If an EEPROM upgrade is necessary, carefully follow the instructions to completion. The process normally takes only a few seconds but should not be interrupted.

Completing the First Connection

Click the **Monitor** menu. A window should appear showing each of the 9 channel measurements in terms of the signal magnitude (mV, mA, Hz or counts) and in Engineering Units (EU) (L/sec, GPM, % etc.). If you have not connected a live signal to the DL's terminal block, the readings may vary erratically. This is normal. If the Signal and EU values are shaded (greyed-out) then you have not connected. Click the **Connect** button in the centre of the main window.

2 Performing Your First Collection

This chapter explains how to collect sampled data from your analog and frequency signals using the DataLogger (DL). If you purchased Analyse Plus without a DataLogger, you can skip this chapter. If you are running the software under a trial period (usually 30 days), without a DataLogger (DL), the measurements from the DL will be simulated. You should still follow through this chapter since it will show the functionality of the DL.

If you have exited Analyse-Plus, execute it again, turn on the DL and click the **Connect** button in the centre of the main window.

Connecting Your Analog and Frequency Signals

To illustrate the main collection functions, you should connect at least two signals for measurement. The DL has 8 analog and 1 frequency measurement channels. Each analog channel can measure voltage or current. The frequency channel can measure signals in the 0 to 30 KHz range. The analog channels have several built-in measurement ranges. However, the minimum and maximum measurable voltages are -5 V and +10 V respectively. The minimum and maximum measurable currents are 0 and 20 mA. You should choose your signals to be measured with the above limits in mind.

The signals that you want to measure must be connected to the terminal block on the DL. The voltage and frequency terminal inputs are high-impedance inputs whereas the current terminals are low impedance (see Appendix B - Specifications). When connecting your voltage and frequency signals, you need not, in general, worry about the DL damaging the device producing the signal to be measured, or vice-versa. That's because the DL includes built-in isolation to 1500 VDC and over-voltage protection to 300 VDC (see Appendix B "Specifications"). (The vast majority of data acquisition devices available for PC's typically provide 30 to 50 VDC of isolation / over-voltage protection). However, you should be careful not to connect these signals to the current measuring terminals since your device providing these signals may be sensitive to the lower impedance. You should also know that the impedance across voltage or frequency terminals is less when the DL is powered off (see Appendix B "Specifications").

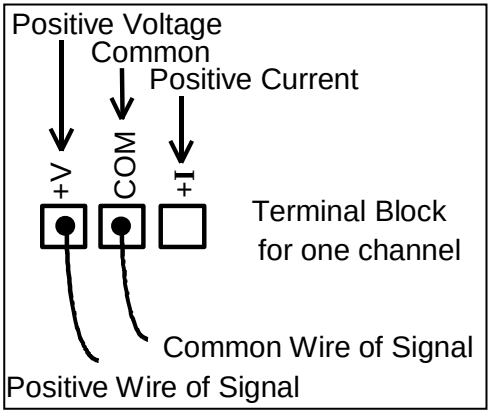
Note: The isolation of signal inputs is intended as a safety feature to protect the user and equipment from the accidental application of over-voltage. The isolation and over-voltage features of this product are not intended to protect against the deliberate application of extreme voltages, such as those above 50 V. If the AC adapter is not in use, a cable capable of carrying at least 20 A (amperes) must be connected between the DataLogger grounding post (to the right of the carrying handle) and a functioning electrical ground (earth).

The DL provides a similar level of isolation and over-voltage protection for current inputs. However, when connecting current inputs, more care is required. If there are other devices using this same current signal, you will have to break that current path in order to pass the current signal through the DL for measurement. You should verify that whatever process or experiment that is currently using that measurement will not be adversely affected. Also, you should check that the device providing the measurement can supply the full range of current to be measured under the total impedance of the circuit. To do this, assume a value of 250 Ohms for the input impedance for current measurements in the DL. Then calculate the total impedance of the circuit and consult the documentation for the device.

To protect the DL against high current, the current input circuit will automatically open if the current rises above approximately 80 mA.

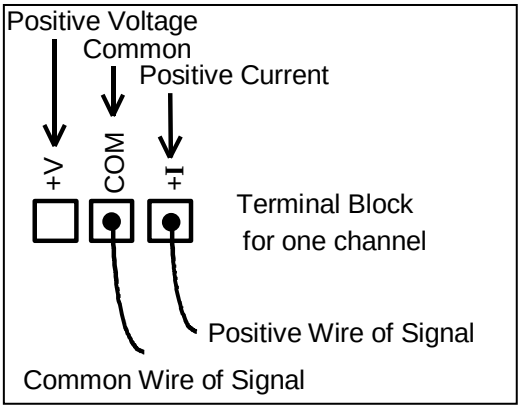
To connect a voltage signal to the DL:

1. Choose which channel to use (channels 1 through 8 are for analog signals).
2. Connect the wires to the terminals on the terminal block for the channel you chose as in the diagram at right.

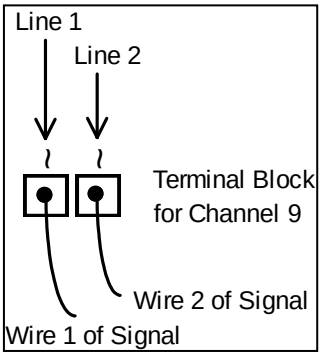


To connect a current signal to the DL:

1. Choose which channel to use (channels 1 through 8 are for analog signals).
2. Connect the wires to the terminals on the terminal block for the channel you chose as in the diagram at right.



To connect a frequency signal to the DL: Connect the wires to the terminals on the terminal block for channel 9 as in the diagram at right. The polarity does not matter. **Note: the polarity could later influence your selection of frequency channel trigger level when you setup the channel inputs in software. See "Setting Up Frequency Channel Inputs" later in this chapter.**



After connecting one signal, you should use the above procedure to connect at least one more so that the collection features that require 2 or more signals can be illustrated.

Using Analyse-Plus to Collect Sampled Data

At this point, the DL should be running, connected to your computer and have at least 2 signals connected to it. You should also have successfully started Analyse-Plus as explained earlier in this chapter and have clicked the **Connect** button, successfully initiating communication between the DL and your computer. You will not need to connect a printer to the print-thru port at this time.

Setting Up Analog Channel Inputs

To setup the channel inputs, in the **Collection** menu, click on **Set-Up Input Channels**. This window allows you to enable channels you will be using and to enter the configuration information for each channel. The top half of the display is for inputting the following:

- Enable/Disable each channel

*Note: Frequency is calculated as counts per second; in other words counts *1000 / sample period.*

The DL, when operating with DOS versions, kept sampled data in memory from all channels whether or not you wanted to keep this data. Under the Windows versions (3.00 & 4.00), the DL only keeps samples data from enabled channels so that the DL's memory is not wasted. The DL holds up to 242688 samples in its own memory (512K RAM) or 111616 samples (256K RAM). So with 2 active channels for example, under DOS, you could only collect 12288 without being connected to a computer whereas under V4, you could collect 121344 samples.

The TDB is intended to help you automate your work. Use of the TDB is entirely optional.

The Status is optional but is very useful for documenting your work.

- Tag (the variable name),
- Description (of the variable),
- Units — the engineering units of the variable.

The bottom half of the display is for inputting the following:

- Status (of the variable) — for documentation purposes,
- DL Input Range — sets the hardware input range in the DL,
- Signal Lo — signal (mV, mA, Hz, counts) value corresponding to EU Lo,
- Signal Hi — signal (mV, mA, Hz, counts) value corresponding to EU Hi,
- EU Lo — the value in eng'g units corresponding to Signal Lo,
- EU Hi — the value in eng'g units corresponding to Signal Hi.
- Mode Select — for frequency channels, specifies whether the binary counts (pulses) should be measured as counts or as frequency (Hz).

First, enable the channel(s) to which you will connect the signals to be measured.

Tag

The **Tag** is the variable name in short form (up to 12 characters). In industrial applications, a typical Tag would be "FIC-1207". The Tag is the main identification parameter for each variable and so the word "Tag" is treated as a synonym for "variable".

All of the information you enter for each Tag is stored in a ***Tag Database File*** (TDB for short). This data is referenced by the Tag. When you click on the Tag pull-down list, all of the Tags you have previously used appear. Selecting a Tag will display the configuration information last used.

If this is a new Tag, simply enter the name. You should choose a unique Tag for each signal that you measure so that the setup information for each signal can be uniquely stored in the TDB.

Description & Units

These are for documentation purposes only.

Status

This refers to the status of the Tag and is meant to help you document your work. Select from the pull-down list or enter text. For example, if this is a control loop, you may want to enter "Auto", "Manual", or "Bump" etc. here. In other applications, you may wish to document the test conditions of your experiment.

All of the setup information for the entire application including the channel setup is stored in a configuration file in addition to the data in the TDB.

DL Input Range, Signal Lo, Signal Hi

The input range determines the maximum and minimum signal voltage, current or frequency corresponding to the full 16-bit resolution of the DL. The DL has several signal input ranges available. The ranges and corresponding measurement resolution (smallest measurable change in signal input) for each range are:

Range	Filter Cut-off (Hz)	Resolution
0 to 10000 mV	500	0.15 mV
0 to 2000 mV	500	0.031 mV
0 to 500 mV	500	0.0076 mV
0 to 500 mV	4	0.0076 mV
0 to 100 mV	500	0.0015 mV
0 to 100 mV	4	0.0015 mV
-5000 to 5000 mV	500	0.15 mV
-1000 to 1000 mV	500	0.031 mV
-250 to 250 mV	500	0.0076 mV
-250 to 250 mV	4	0.0076 mV
-50 to 50 mV	500	0.0015 mV
-50 to 50 mV	4	0.0015 mV
0 to 20 mA	500	0.00031 mA

Note that there are 12 voltage ranges and 1 current range.

The frequency channel has one range: 0 to 65535 counts in one Count Accumulation Period, or 65535 Hz (Hertz), whichever is smaller.

Tip: the Signal Lo and Hi values do not need to be the minimum and maximum signals you will be measuring. They only need to be correct for the corresponding EU Lo and EU Hi values. For example, for a 0 to 2000 mV range, you could enter 500 and 700 as the Signal Lo and Hi but the DL will still measure across the entire 0 to 2000 mV.

Generally, smaller ranges are provided so that you get the highest possible precision and resolution of measurement even with a very small signal. You should always choose the smallest range that will fit your signal. For instance, if your signal input was 0 to 1000 mV, for a temperature measurement of 10 to 150 deg C, you could choose a range of 0 to 2000 mV or -1000 to 1000 mV. Both of these would give more resolution and accuracy than the 0 to 10000 mV range.

All of the ranges are software selectable using the pull-down list. There are no switches or jumpers in the DL.

The DL Input Range and the Signal Lo / Signal Hi values are related. The Signal Lo value is the signal input value corresponding to the calibrated EU (Engineering Units) Lo value. Similarly, the Signal Hi corresponds to the EU Hi value. The Signal Lo and Signal Hi values are normally the minimum and maximum output values of the transmitter, respectively, and are determined by its calibration. So in the above example, the following values would be entered:

Signal Lo	Signal Hi	EU Lo	EU Hi
0 (mV)	1000 (mV)	10 (deg C)	150 deg C

When you switch from a voltage range to the current range, you needn't worry about the difference in impedance between the two input types. That's because there are separate voltage and current terminals on the terminal block. The voltage terminals are always high impedance and the current terminals are always low impedance — so your signals will not be subjected to any impedance change when you change ranges.

The *filter cut-off* appears in the table on the previous page. Almost any signal has some high frequency content, which may be intentionally present or may simply be "noise". In any sampling device, it is important to remove elements of the signal that are at a frequency faster than half of its base sample rate. The purpose of this is to prevent "aliasing" — a serious distortion of the true signal when this rule is not followed. Any well-designed measurement device will contain an electronic hardware filter to remove these elements *before* sampling takes place.

See Appendix B for filter specifications.

A filter is designed around the objective of removing specific frequencies. The point at which the filter nominally begins this, is called the *filter cut-off frequency*. Frequencies above the filter cut-off frequency will be attenuated (reduced). The higher the frequency, the more it will be reduced. How the amplitude decreases with frequency is determined by the number of *poles* (or *orders*) that the filter has. Generally, it is considered better to have more poles.

Analyse-Plus provides a software digital filter in the computer during collection and the DL provides one for anti-aliasing. See both "Setting-Up Math Channels" and "Anti-Aliasing Digital Filter" later in this chapter.

The DL also has an electronic hardware filter. The base sample rate of the DL is 1000 Hz so the filter cut-off frequency is 500 Hz. It is a 4-pole filter. It will attenuate frequencies at 500 Hz by 34 %. Higher frequencies, for example, at 1000 Hz, will be attenuated by 94 % (virtually eliminated). **All analog ranges are equipped with this filter.**

*You can also perform software digital filtering after collection. Click the **Modify** menu, **Perform Math…**and click **Help**.*

In the table of ranges on the previous page, the smaller voltage ranges are duplicated to provide 2 choices of analog filters — 500 Hz and 4 Hz. The 500 Hz choice is the filter described above. The filter with the 4 Hz cut-off frequency is a single pole (1st order) filter and is meant for another purpose. If you are measuring very low voltage signals, there may be a large amount of noise compared to your actual signal. Assuming that in these cases you are sampling relatively slowly, you may wish to filter out this noise before the sampling takes place. The alternate ranges with the 4 Hz cut-off frequency are provided for this purpose. When you select these ranges, both the 500 Hz and 4 Hz filter are used simultaneously (in series). The 4 Hz filter will attenuate frequencies at 4 Hz by approximately 30 %, and those at 60 Hz by 95 %.

If you are unsure which filter is right for your application, choose the range having the 500 Hz filter.

Select the range and enter the Signal Lo and Signal Hi for the input signals you will be measuring now.

EU Lo, EU Hi
These are the values in Engineering units corresponding to the Signal Lo and Signal Hi. These values are used to scale the measurement from voltage, current or frequency to any engineering units. For example, if a pressure transmitter measured 0 to 100 PSI and its output signal were 1 to 5 V, then the EU Lo would be 0 and the EU Hi would be 100. (The Signal Lo and Signal Hi would be 1000 and 5000 mV, respectively). In the example earlier in this section, the EU Lo and EU Hi would be 10 and 150 respectively.

In some R&D applications, you may not want to use any engineering units — you may want to display the measurement in terms of its voltage, current or frequency. To do this, just enter the same values for EU Lo and EU Hi as you did for Signal Lo and Signal Hi. Then enter the Units (see below) of the signal as mV, mA or Hz.

Enter the EU Lo and EU Hi values now.

Setting Up Frequency Channel Inputs

The procedure for setting up the frequency channel (channel # 9) input information is almost identical to that of the analog channels. This procedure will be explained in terms of the differences. Refer to "Setting Up Analog Channel Inputs" earlier in this chapter.

In the **Setup Input Channels** window, enter the setup information as described above for the analog channels, using the TDB when you wish. There are only three differences:

- the frequency channel has no ranges — the range is fixed at 0 to 65535 counts or 65535 Hz, whichever is smaller,
- the concept of sampling is replaced by accumulating, and
- the frequency channel has **Trigger Levels**, and a **Mode Select.**

The DL measures frequency by counting pulses or cycles. The number of pulses counted in a given time represents the **average** frequency over that time period. The unit of measure of frequency is Hertz (abbreviated Hz) and is just a short form meaning "cycles per second". For example, if 2000 pulses occurred in 0.5 seconds, then the **average** frequency over the two seconds would be 4000 Hz.

The DL measures analog channels by taking a snapshot measurement of the signal. (All of the 8 analog channels are sampled at exactly the same time and held. Then the signals are measured rapidly in succession.). For example, if the sample period were one second, then the sampling would take place at the same moment at exactly one-second intervals.

*The **Count Accumulation Period** is normally entered when you choose the **Sample Period** in the **Start/Stop Collection** window.*

The DL measures the signal from the frequency channel by accumulating pulses over a time period called the *Count Accumulation Period*. At the end of the Count Accumulation Period, the number of counts is reset. The sample value contains the number of counts but can optionally be converted to a frequency. This is done by dividing the number of counts by the Count Accumulation Period. The Count Accumulation Period can be set to any value less than or equal to the Sample Period. When the sample value is converted to frequency, the resolution or "granularity" of the reading will be lower with small Count Accumulation Period values (e.g. less than 1 second).

Mode Select
In the **Set-Up Input Channels** window, this specifies whether you want the counts to be converted to a frequency (in Hz) or left as counts. Regardless of the setting, the result will be scaled according to the Signal Lo/Signal Hi and EU Lo/EU Hi. The frequency is calculated as:
Frequency = counts X 1000 / Count Accumulation Period

This setting also determines the units of the Signal Lo/Signal Hi values (and indirectly, the Collection Triggering Limits since they are in terms of EU (Engineering Units)).

Note that the above formula also indicates how the resolution of the frequency measurement is affected by the Count Accumulation Period, especially at a low Count Accumulation Period setting (less than 1 second).

Range/Trigger Level
When measuring the frequency channel, the DL needs to have a criterion to decide if a voltage change in the signal should be considered a pulse. That criterion is called the *trigger level*. The trigger level specifies how much the voltage must change to be considered a new pulse. If you have no information about the size of the pulses in your signal, you should first try using the default (lowest) trigger level. You can then verify that triggering is occurring and that the measurement is correct using the **Monitor** window. If it is incorrect, try the higher trigger level. Generally, the higher frequency measurement is the correct one.

Due to the design of the DL, the trigger level that is most appropriate may depend on the polarity of the wires if your signal has a pulse (rather

than square or sinusoidal) shape. You may need to try both trigger levels in the manner described in the previous paragraph.

You select the trigger level in the same way as you did the ranges for the analog channels.

Enter the Signal Lo and Signal Hi in the same way as you did for the analog channels. Since the frequency channel can be set to measure counts or frequency (see **Mode Select** above), these values should be entered in the same measurement units (counts or Hz). The value must be between 0 and 65535 (the fixed input range of the frequency channel).

Exiting the "Set-Up Input Channels" Window and Saving the Configuration

Click on **OK**. All set-up data is saved.

Setting Up Math Channels

Math channels did not exist prior to version 3.00. They provide all the functionality of the Processing *options in those versions plus much more.*

Math Channels are pseudo channels that calculate data from one or more input channels. If you are mainly interested in testing the data collection hardware and software at this time, you may wish to cover this topic later.

Generally, a math channel has one sample for each sample of the input channels. In other words, if you are collecting 10000 samples, the math channels will also collect 10000 samples. Math channels are configured by entering equations. For example, designating the input channels as s1 through s9, a simple equation for math channel 1 would be:
s2+s3.
A more complex equation would be:
sine(butterworth,l,1,1,2,s1-2/s3*sqr(s3/s8))

If you enable m input channels and n math channels, then each collection will yield m+n files. In other words, math channels do not replace the input channels.

First, click **Set-Up Math Channels** from the **Collection** menu. Then enable any channel to use (1 to 9). Enter a formula in the Current Formula box or double click on a previously entered formula in the **Formula History** box. Edit the formula or use **Function Select** to build the formula using the computer's prompts.

The library of available functions is extensive. Some functions cannot be used during a collection. These functions were designed to work with the **Perform Math on a Quick List File** window in the **Modify** menu.

The On-Line Help contains extensive documentation on the use of math functions including a description and mathematical specification of each.

Example Function: Digital (Software) Filtering

In version 2.04, this was a Processing *option and allowed a separate filter for each channel. In earlier versions, there was one digital filter for all channels.*

Digital filters are one commonly used group of mathematical functions. They are intended to provide software filtering of collected data in addition to the hardware filtering discussed in "DL Input Range, Signal Lo, Signal Hi" earlier in this chapter. The hardware filters only apply to analog channels whereas software filtering can be done on any channel.

The principal application for a digital filter is to smooth the signal by reducing noise or variability of no interest. Guidelines for choosing filters are in the **Help** topic *How To Filter A File*.

Unless you have special needs, a good choice for a filter is the Butterworth filter with the order set to 1 or 2. An order of 1 will have the same effect as a common exponential (first order) filter used in most

industrial computer systems. This is also the same type used prior to version 3.00.

*Square Root Compensation is another commonly used function for converting differential pressure to flow. See the **Help** topic* Square Root Extraction *for more information.*

To create a digital filter, click on the **Setup Math Channels** function in the **Collection** menu. Enable a math channel you wish to use. Click in the formula window for that math channel. Click the **Function Select** button and select **Filters**. Choose the filter type, order and cut-off frequency. You must enter the last parameter, which defines the Input Channel to filter (s1 through s9). Note that a low-pass filter keeps low frequencies and high pass keeps high frequencies.

You can also filter signals later (anytime after collection is finished) by clicking **Perform Math on a Quick List File** from the **Modify** menu.

Exiting the "Set-Up Math Channels" Window and Saving the Configuration
Click on **OK**. All set-up data is saved.

Verifying Your Channel Setup and Measurement

After you have connected the signal wires and entered the channel setup information, you will want to verify that the measurement is correct. You can then be confident that you have good wire connections and proper setup information.

To do this, click the **Monitor** menu. If you are performing your first collection, you should select this function now.

The display shows the present measurement of all channels in mV, mA or Hz, and the equivalent value in engineering units. The sampling of these signals is independent of the collection sample period in the **Start/Stop Collection** window (documented later in this chapter). The analog measurements are "snapshots" taken every 0.5 sec. The frequency measurement is based on a 1 second Count Accumulation Period and so represents the total counts or average frequency over the previous 1.000 seconds ending within 1 second ago. For a description of how the DL measures the frequency channel, see "Setting Up Frequency Channel Inputs" earlier in this chapter.

If the frequency measured by channel 9 is greater than 65535 Hz, the maximum frequency measurable by the DL, then "Overflow" will be displayed instead. Note that the DL's hardware is designed to provide reliable measurement up to 30000 Hz; higher measurements may occur and may or may not be exact.

You should verify that the measurements for the channels with signal wires connected, are nominally correct. If any values appear incorrect, check that you have connected the wires correctly and that you have entered the channel input setup information correctly. For analog channels, be sure to check the polarity, as well. For frequency channels, be sure to try the other trigger level.

This display also shows the collection status and progress at all times. Click **Detail** to list additional channel setup information.

Setting Up and Starting the Collection

To setup the collection parameters in preparation for collection, click on **Start/Stop Collection** in the **Collection** menu. If the display is greyed-out (shaded) then the computer is no longer communicating with the DL. If so, click on the **Connect** button in the centre of the main window.

In this window, you can perform the following actions:

- modify the Data File Path, Name Prefix and Name Suffix which, together specify the name and location of the data files that will contain the sampled data;
- modify the Log File name which keeps a record of your work;
- enter comments to document your work,
- specify the collection sample period;
- specify the collection Count Accumulation Period for frequency channels;
- specify the number of samples to collect;
- specify the Anti-Aliasing Digital Filter Time Constant Ratio;
- specify that a new Triggered collection should be started immediately when the current collection ends;
- start the collection;
- stop the collection;
- start a triggered collection.

*For more information about these files, click the **Help** button in this window.*

Data File Path, Name Prefix, Name Suffix & Log File

The 3 items in the box just above the centre of the window concern file names used for saving collection data. The *Name Suffix* will be zero if this is your first collection. The names of the files that will hold your sampled data (*data files*) are created by appending the **Data File Path, Name Prefix, Name Suffix** and a letter **a** through **r**. The letters designate the channel number (a is input channel 1, i is input channel 9, j is math channel 1, r is math channel 9). The file extension is always .CSD. The **Name Suffix** is always a 4-digit number and specifies the filename to be used next.

For example, if the data file path/prefix is "C:\APLUS400\DATA\JKS" and the numeric suffix were 59, then the name of the file containing the data from channel 2 would be: "C:\APLUS400\DATA\JKS0059B.CSD".

If you wish to start a new project or area of study, you may wish to change the **Name Prefix** and zero the **Name Suffix.**

*To print the Log File, double click on the file in the C:\APLUS400\DATA directory in your Windows Explorer. This will normally open the file with Notepad or WordPad. Select **Print** from the File menu there.*

The Log file records a summary of your work. To view the log at any time, click the **File** menu and select **View/Search Log File**.

Comments
This is strictly for documenting your work. It is saved in the Log File and in each data file.

Sample Period
The sample period is the period at which samples are taken when the DL is collecting. It is expressed in msec (milliseconds) per sample. (Click the **msec** / **sec** button to switch between msec and sec). Since 1 msec equals 0.001 seconds, a sample period of 1 means that a sample is taken every 0.001 seconds or that 1000 samples are taken from all channels every second. A sample period of 1000 means that 1 sample is taken on all channels every second.

If you know what sample period to use, you can skip this section.

If you wish to think in terms of frequency, remember that frequency and period are inverses. To convert frequency in Hz to period in msec, use the formula: Period=1000/frequency.

The DL's fastest sample period is 1 msec and the slowest is about 4.2 X 10^9 msec (about 50 days).

The DL samples all channels simultaneously regardless of the sample period or the number of channels in use. In other words, a sample rate of 1 msec means that there is a space of 1 msec between each sample of a given channel, regardless of how many channels you are using.

You cannot change the sample period while the DL is collecting.

Choosing the Sample Period With Frequency Inputs
Whereas analog inputs are sampled, frequency inputs (pulses) are accumulated. At the end of the accumulation, the pulse count is reset. The interval of accumulation and resetting the count is called the Count Accumulation Period. The Count Accumulation Period can be set independently, but it must be less than or equal to the Sample period. For more information see "Setting Up Frequency Channel Inputs" earlier in this chapter.

*If you don't know what Sample Period to use, see the **Help** topic* How to Choose the Collection Sample Period.

The frequency sample is taken at the same time as the analog samples. The frequency sample can be measured in terms of counts, or converted to a frequency in Hz, either of which will be scaled to the EU Lo/EU Hi you specified. This conversion is specified by the **Mode Select** specified in the **Set-Up Input Channels** window.

Count Accumulation Period
The Count Accumulation Period is the interval at which the pulse counter for the frequency channel is read and reset. Whereas analog inputs are sampled, frequency inputs (pulses) are accumulated by a counter in the

DL, then read by the DL, then reset. The Count Accumulation Period can be set independently of the sample period, but it must be less than or equal to the Sample Period. Regardless of the Count Accumulation Period, one sample will be generated at each Sample period.

For more information on Stand-Alone Mode, *see the "Stand-Alone Mode"* ***Help*** *topic.*

DOS versions could only operate in Stand-Alone mode and could only collect up to 12288 samples regardless of the number of active channels.

Number of Samples
This is the number of measurements (samples or points) to collect on each channel. The DL can collect in normal or *Stand-Alone* mode. In Stand-Alone mode, the DL can collect as many samples as it can hold in its memory. This is a total of 242688 samples (512K RAM) or 111616 samples (256K RAM) divided among the active channels (26960 samples per channel if 9 channels are used with the 512K RAM version). (The amount of RAM is displayed when you Connect to a different DL or Connect for the first time after starting Analyse-Plus). When the desired number of samples is collected, the computer reads all of them from the DL and saves them to your hard disk. At this point, the collection is considered to be finished and you can start a new collection if desired.

In Stand-Alone mode, the DL can be disconnected at any time after the collection has started (to perform a collection on another DL, to move the computer to a safer environment, to take the computer to a printer, etc.). When the computer is reconnected, the samples will be retrieved from the DL and saved to disk. **Remember to click on the Disconnect button in the main window before physically disconnecting the DL!**

In normal mode, an unlimited number of samples (up to 4.27 billion) can be collected in a single collection. The computer repeatedly executes a cycle of reading samples from the DL and saving them to your hard disk a few thousand samples at a time. This is sometimes called "continuous streaming to disk". If the Number of Samples exceeds the **Data File Size Limit** (set in the **Options** menu), the collection will span multiple data files for each channel.

If you intend to do Fourier analysis, the calculation is far faster if the number of samples is a power of 2. This only becomes significant with large files (e.g. 65536, 131072 etc.)

When you enter the number of samples, the total time to perform the collection is displayed to its right.

For more information on Anti-Aliasing, *see the "Aliasing — A Simple Explanation"* ***Help*** *topic. This is new for version 4.00.*

Anti-Aliasing Digital Filter
In any sampling device, it is important to remove elements of the signal that are at a frequency faster than half of its base sample rate. The purpose of this is to prevent "aliasing" — a serious distortion of the true

signal when this rule is not followed. This was briefly discussed earlier in this chapter.

The Anti-Aliasing ***Analog*** Filter was also presented earlier in this chapter and exists in the hardware of the Data Logger CVF2 to remove frequencies faster than 2 msec (500 Hz). This is ideal because the Data Logger actually samples at a fixed period of 1 msec. To achieve slower sample rates that you choose, the Data Logger sub-samples this data. For example, to achieve a sample period of 100 msec, the Data Logger keeps very 100^{th} sample and discards the remaining 99.

Aliasing can also occur during this sub-sampling (digital sampling). The **Digital Anti-Aliasing Filter** exists to prevent or minimize this. This is done by *digitally* filtering the sampled data every 1 msec *before* the digital sampling occurs. The CPU (processor) in the CVF2 does this.

Use the **Anti-Aliasing Digital Filter** to prevent aliasing from occurring. Enter the time constant of the filter expressed as a ratio to the sample period. The value is expressed as a ratio so that you only need to enter this value once for all sample periods to achieve consistent protection against aliasing. Values from 0.318 to 1.5 are recommended. The cut-off period to its right shows the period at which the filter's effectiveness begins. Variability having a lower period (higher frequency) than this will be progressively more attenuated.

For example, suppose your sample period is 100 msec. A ratio of 0.318 gives a time constant of 31.8 msec. The cut-off period is 2 X Pi X the filter time constant. In this case, this is 200 msec. Since aliasing will occur when variability is present at 200 msec or slower, this is a good starting point for the filter setting. The same value will work in the same way for any sample period. In this case, variability at 200 msec will be attenuated about 30 % while that at 50 msec will be attenuated 82.5 %. Note that the effectiveness of the filter increases quite slowly with variability of progressively lower periods (called the *roll-off*). This is because a *First Order* digital filter is used. Contrast this with the Anti-Aliasing Analog Filter used in the hardware of the Data Logger CVF2. It uses a fourth-order *analog* filter. Generally, higher order filters are desirable to provide a faster roll-off.

Start Button
Click this to start a collection. If it is greyed-out (shaded), either the DL is currently collecting or is disconnected. When collection starts, you will see the COL ("Collecting") LED on the DL illuminate.

When collection is finished, the END ("Collection Finished") LED on the DL will illuminate and the COL LED will switch off.

Stop Button
Collection stops automatically after the selected number of samples have been collected. Click this button if you want to stop the collection at any time before then. The remaining data collected by the DL will be saved to disk, the COL LED on the DL will switch off and the END LED will switch on.

*For more information about Triggered Collections, see the **Set-Up Triggering** or the **Trigger Restart** topics in the on-line **Help**.*

Triggered Restart Check-Box & Start On Trigger Button
The **Start On Trigger** button is for initiating a collection that will start (trigger) before or after (Pre-Triggering VS Post Triggering) the signal measurements reach a certain criterion or to delay a collection to start at a specific time. This is a very powerful feature and is documented in the **Set-Up Triggering: Overview** topic in the on-line **Help**. If it is greyed-out (shaded), either the DL is currently collecting or is disconnected or you have not specified any Trigger Criteria or Trigger Delay in the **Set-Up Triggering** window.

*You can also configure the DL to start a collection at a specific time — a "Delayed Collection". See the **Set-Up Triggering: Overview** topic in the on-line **Help**.*

If the **Triggered Restart c**heck-box is checked, then the DL will automatically start a Triggered Collection as soon as the current collection ends (the next millisecond). (The first sample of the next collection will be taken when the Trigger Criteria is satisfied and the Trigger Delay expired). This is the same as automatically clicking the **Start On Trigger** button at exactly the right time each time a collection ends. When Triggered Restart is on, Stand-Alone mode is not possible. However triggered collections (Triggered Restart is off but start the collection with **Start On Trigger**) are still possible in Stand-Alone mode.

***Pre-Triggering** is new for Analyse-Plus V4.00. It allows starting a collection* before *the Trigger Criteria are met so that you can determine the cause of the event.*

*Note: If you want to restart a collection when the current one is finished without checking the Trigger Criteria, instead just specify a larger **Number of Samples** to collect and specify the **Data File Size Limit** if you require files of a specific size.*

Plotting the Sampled Data As It Is Collected

To use the collection plot, you need to be collecting now or have done a collection since starting Analyse-Plus. To start a collection, see **START** above.

From the main menu, click on the **Plot** menu, then **Plot Data As Collected**. You will see a series of traces, one for each enabled input channel. Click the **Math Channels** button to see Math Channels. (This will be greyed-out if you have none enabled). The right side of the graph shows the Tag, Units and various identifying information as well as the last value plotted (usually the same as the last value sampled by the DL). At the bottom of the window, the DL's collection status is indicated. The time indicates when the first sample of the collection was taken by the DL. This is true even in the case of Triggered collections whether they are Advanced/Delayed by Pre/Post Triggering. It is also true if the

collection spans multiple data files.

In the lower right, the plot palette is visible. This includes tools for manual or auto scaling, zooming in several different ways, etc. When you zoom one plot, the new time span will be used in all plots so that they remain synchronized. You can also manually scale by clicking on the y or x axes labels. Generally, it is easiest to keep the y-axis auto-scale locked on and use the palette for zooming the x-axis.

*The on-line **Help** has a more detailed description of the palette.*

To change the plotting colours, click on the **Colors** button.

Tip: If you want to plot sampled data from a previous collection you need to you use **Plot Quick List Data** *from the **Plot** menu. This also allows printing. See the **Help**.*

When the Collection Ends

If the DL finishes collection, the remaining samples from the DL are saved to your hard disk. If Triggered Restart is on, a new collection will be started as soon as the last sample of the current collection is sampled.

***Important Tip: To get the most out of the DL, it is important to understand Standalone mode.** More information is available in the* **Help** *menu.*

If you have disconnected the DL during a *Stand-Alone* collection, then the sampled data will be saved to disk when you click the **Connect** button once again. Until that time, the samples will remain in the on-board memory of the DL. ***Do not power off the DL until the samples have been saved to disk. The samples will be lost if you do so!***

If you were performing a normal (not Stand-Alone) collection, the data is saved to disk as it is collected.

Exiting Analyse-Plus

Unlike the DOS versions, your configuration and TDB files are saved at various times when they change, rather than once when you exit the program.

To exit, first click the **Disconnect** button in the centre of the main window. Then from the **File** menu, choose **Exit**. You will be warned if you have files that you have modified but not saved.

Never turn off your computer when running this application. Always exit and shutdown Windows properly.
Never power off the DL until the sampled data has been saved to your computer's hard disk. Click on the **Disconnect** button in the main window.

3 Key Features And Tools

On-Line Help

*The main reference for Analyse-Plus including DataLogger CVF2 data collection is the on-line **Help**. This chapter provides a brief overview to help you start using the software quickly. Use the Help for any questions you may have.*

The Quick List & Multiple Files

The *Quick List* is simply the list of files that are open or available for immediate use. It holds 300 files. When you open a file, it appears at the top of the list. When you modify a file, it will move from its present location in the Quick List to the top.

A divider labelled "Recently Collected Files" exists part way down the list. When data files are created via data collection, these files appear under the divider. When the Quick List becomes full, recently collected files will drop off the list. You can open them again if you wish to work with them. Files that you have modified but not saved will never drop off the list (unless you have 300 of them!).

*Tip: **Open** (in the **File** menu) allows you to select multiple files, an entire directory or multiple directories. The first 280 .CSD files will be opened.*

The number of files above or below the divider is flexible but space for 20 is reserved for recently collected files at the bottom.

Analyse-Plus is designed to work with multiple files. For example, the **Open** window allows you to open 280 files at a time (300 minus 20). You can also Save, Import, Export, Plot, Analyse and perform Math on several files at once.

Plotting And Analysing

To plot and analyse data, first make sure the files of interest are in the Quick List (see above). Then click on the **Plot** menu, then **Plot Quick List Data**.

The main features of plotting in Analyse-Plus are:

- Time Series, Fourier (frequency spectrum), Integrated Fourier, Auto-Correlation and Cross-Correlation plots;
- Traces can be plotted separately (1 trace per graph up to 4) or overlaid (up to 10 traces in different colours on the same time or

frequency axis);
- The x-axis of Fourier and Integrated Fourier plots can be scaled in terms of frequency (standard) or period (non-standard). If set to frequency, it can be labelled in terms of frequency or period and switched at will;
- The amount of overlap of traces in Overlay plots can be specified;
- Both axes can be manually or automatically scaled;
- Both axes can be linear or log;
- The plot can be dragged with a mouse to "scroll" through the data;
- A grid can be displayed;
- Various statistics can be displayed on the plots;
- Statistics can be calculated from the entire file or from the viewed region only;
- Colours can be configured for clarity or according to taste;
- A cursor can be placed on any of the 10 traces and the value in Engineering Units with the time/frequency/period are displayed;
- Six zoom/unzoom modes are available;
- Printing can be done in colour or B&W without configuring colours (even if using a colour printer);
- For B&W printing, you have control over the substitution of grey tones for colours to distinguish traces.
- The graphic image can be copied to the clipboard or exported to BMP, PNG or JPEG graphics file formats.
- The data plotted in any graph can be copied as text to clipboard.

*The On-Line **Help** includes topics to assist in interpretation of Fourier, Auto-Correlation and Cross-Correlation plots. See the* How To *topic.*

First choose the **Plot Pattern** (Overlay-Time, Overlay-Frequency or Separate). Select the **Axis Scaling** (linear or log). Choose the **Plot Type**. Click on the **QL** buttons at left to choose your files from the Quick List (hold down the Shift key to select multiple files or drag the mouse while holding down the Shift key). If you are plotting a Cross-Correlation, use the **QL** buttons at right to select the second file. Choose the **% Overlay** (overlap of each trace) for Overlay Time plots. Choose the statistics you wish to display (**1st Statistic, 2nd Statistic**).

If you are plotting any Fourier or Integrated Fourier plots there are 4 options to allow you to customize the presentation to your taste. The first affects both the presentation and the numeric result slightly whereas the others only affect the presentation. They are:
- **Window For Fourier** (Hamming, Blackman etc.) for preventing "leakage" from one sample to another;
- **Fourier Scale** can be set to Amplitude or Power. Power = $\text{Amplitude}^2 / 4$ (much like choosing between standard deviation and variance in statistics);
- **Presentation** to draw the amplitude/power at each frequency/period as a vertical bar or to connect each point;

- **X-Axis Linearity** to space the plotted data in terms of linear/log frequency or linear/log period on the x-axis. If set to frequency, the x-axis can be labelled in terms of period or frequency units.

Click the **Plot** button.

The plot palette in the lower right corner of the plot(s) is the key to getting the most out of the plotting and analysis functions. Zooming is perhaps the most important (icon in top row, second from right). The **Help** has a point-and-click guide to palette functions.

Click on the **Stats** button to see statistics for the entire file (extents) or the viewed region.

Printing

Only plots can be printed. To print the Log File, use NotePad, WordPad or your favourite editor or word processor.

If you are printing through a network, USB or a serial port or have not physically connected the DataLogger to the computer's parallel port (in other words, the printer is currently plugged into the parallel port), simply click on the **Print** button in a Separate or Overlay Plot. There, select whether you wish to print a colour or B&W image (normally depends on whether you are printing to a colour (usually InkJet) or B&W (usually laser) printer and set the **Output** to **Printer**. Click OK and the standard print dialog box will appear allowing you to choose the number of copies etc.

You may print while using the DataLogger (DL) through a network, USB or serial port or, in most cases, to the parallel port. Printing through anything except the parallel port is straight forward — if you are currently "Connected" (PC is communicating with the DL because you clicked on the **Connect** button), you will be asked if you intend to print using the parallel port used for communication with the DL (say No). If you do not see this message, it is because you have no printer objects configured to use such ports. You should configure them first using the Windows Control Panel.

If you wish to print through the parallel port, connect the DL to the computer's parallel port and connect the printer to the DL. When the PT LED (Print-Thru LED) on the DL is on, all printing traffic from all applications will pass through the DL on to the printer without intervention by the DL.

The PT LED, when on, indicates that the computer and DL are not communicating (not *Connected* in communication). Click the **Connect** button in the centre of the main window to initiate communication. Connection will be successful if the parallel port is not in use by Windows (or any application) for the purpose of printing. (If busy, you will be notified). When you click on the **Print** button in a Separate or Overlay plot, and all of your printer objects are configured to use the parallel port or you indicated that you want to print using the parallel port, a Disconnection with the DL will be done if possible. This is the same as clicking the **Disconnect** button on the main window — it stops communication to allow printing. Click the **Connect** button when printing is done and you are ready to work with the DL again.

Disconnection may not be permitted if you are performing a type of collection that requires constant communication with the computer for the purpose of saving sampled data to disk. Specifically, disconnection is permitted if you are not performing a collection or if the DL can operate

in Stand-Alone mode. You can know this in advance of attempting to print by looking in the bottom half of the **Start/Stop Collection** window; it indicates if Stand-Alone mode is possible and whether the DL is idle or collecting.

A benefit of operating the DL in Stand-Alone mode is that you can print and collect data at the same time.

Copying the Plot Image to the Clipboard or Exporting It

The PNG file format is recommended for all uses. It is results in a far smaller file than a BMP file and a better image ("loss-less") than a JPEG file. Even an MS Word document is usually smaller when importing a PNG file than copying & pasting.

To copy the Overlay or Separate plot image to the clipboard or export it to a graphics file (to include it in a document or merely to save it), click on the **Print** button at the bottom of either of these plots.

Choose the Print/Image **Color** and **Output**. For JPEG, there is a direct relationship between image quality and file size. For PNG, higher compression does not affect the image quality. It just makes the files smaller, requiring slightly longer to create them.

PNG files are often 20 times smaller than BMP files and are recommended for all uses.

The **Color Depth** determines how faithfully the colours are represented in the file or clipboard. 8-bit normally suffices. 24-bit is better in some cases but results in larger files.

Click **OK**. For graphics files, the default file name is chosen from the path and name of the first file in the plot.

Copying the Plot Data to the Clipboard

To copy the plot data as text to the clipboard for pasting into another application, click on the **Copy** button at the bottom of the Overlay or Separate plots.

Select the file you want to copy and whether you want to copy the entire plot or only the viewed region.

Click **OK**.

Math Functions

Analyse-Plus includes approximately 50 math functions. Calculations can be performed during a collection from DataLogger CVF2 input channels or at any time from Quick List files.

In the first case, the calculations are done by employing *Math Channels***.** The channels are configured by clicking **Set-Up Math Channels** from

the **Collection** menu. There, you enter formulas that calculate one value for each sample of one or of many input channels. The names *s1* to *s9* denote the 9 input channels. Formulas are entered with function names, +, -, *, /, brackets etc.. For example, this is a valid formula: 3*s1-sine(4*s2/(9.345-s5))

Functions that require knowing future sample values or whose calculation results in a different number of samples than existed in the input are not allowed in Math Channels (they will be greyed-out).

One of the most useful Math function groups is *Filters*.

To perform calculations on files in the Quick List, click **Perform Math on a Quick List File** from the **Modify** menu. Click the **Modify** button to assign different Quick List files to the variables *s1* to *s10*. Then, enter the formula in the **Current Formula** box.

In both cases, the easiest way to enter formulas is by clicking on the **Function Select** button. A window will appear, on the left of which appear the various function groups and on the right, the functions for each group. When you double-click on a function, a window appears with entries to complete. When you click **OK**, the function is inserted in the **Current Formula**. There, enter the function input in the space provided (*s1* through *s10*). Click on **Help** to get an explanation of each function

In both cases, a Formula History allows you to choose from the last 20 formulas you created. Just double-click on the formula you wish to use. Click **Clear Formula** first if you want to erase the existing formula.

Click **OK** on the bottom of the window to execute the calculation.

Editing

You can edit all attributes of a data file such as Tag, Description, Status, etc., as well as the samples themselves. Choose **Edit** from the **Modify** menu and select the desired file from the Quick List. Edit any item.

If you wish to save it to a new file, change the filename at the bottom of the window. If you wish to keep the changes in the same file, do not change the filename. In either case, your changes will not be permanent (irreversible) until you select **Save** or **Save As** from the **File** menu.

Saving

This command can be found in the **File** menu. To save one or more files, click on **Save** or **Save As**. Click on the files in the Quick List that you

wish to save. Hold down the <Shift> key to select multiple files (drag the mouse for a group of consecutive files). The rightmost column in the Quick List indicates if the file has already been saved (not yet modified). If you select a file that has already been saved, Analyse-Plus will simply ignore that file.

Click OK in the Quick List and again in the Save / Save As window. If you chose **Save**, you will be prompted for a filename and location only if the file is new (files created using **Perform Math on a Quick List File** or **DDE Receive** are new). If you chose **Save As**, you will be prompted for every file.

Importing And Exporting

You can import ASCII (text) files by clicking on **Import From ASCII** in the **File** menu. The result is a .CSD (data) file. To export a .CSD (data) file, click on **Export to ASCII**. Importing and Exporting is usually done to transfer data between Analyse-Plus and another application. If the other application supports DDE, you may find it quicker to use **DDE Receive** or **DDE Send**. The Help file contains simple instructions for using DDE with Excel™ and other applications.

Importing

Analyse-Plus can import almost any type of Text file. When you select the text file, it will try to determine the delimiters used between columns (comma, spaces, etc.) and the type of time data. The text file may have no time stamp column, may have one time stamp column that specifies the sample period for all columns of sampled data, or it may have one time stamp column for each column of sampled data (alternating). The time stamp data is only used for determining the sample period. You can override the calculated sample period or manually specify the delimiters.

The columns of data do not have to be the same length.

In the last step of importing, specify the desired filenames only for columns you wish to import. Remember that each name in the Quick List must be unique even if the files will be saved to different directories.

Exporting

When exporting files, you can choose multiple data files from the Quick List if you wish. In this case, you can export them to a single text file with multiple columns or to multiple text files (one for each data file). Choose the delimiter and the format of the time stamp.

If you are exporting multiple data files to a single text file, the first column will be the time stamp (time index) data if every data file had the

same sample period. Otherwise, there will be one time stamp column for each data file (alternating).

If you are exporting multiple data files to multiple text files, you can save time by selecting **Use Source With New Extension**. This will choose the directory (folder) and filename of each text file automatically. The folder of the text file will be the same as the data file and the filename will be the same except a .TXT extension will be used in place of .CSD. If you wish to explicitly specify the path and filename for each text file, click **Select New Path and Name**.

Exported text files tend to be much larger than the corresponding data files. Most users delete them after use.

DDE

DDE (Dynamic Data Exchange) is a quick and easy way to send or receive data between Analyse-Plus and other applications. It is generally faster than exporting and importing.

The three DDE functions in Analyse-Plus can be found in the **File** menu:
DDE Send
DDE Receive
DDE Server

In DDE Send and DDE Receive, Analyse-Plus is a *client* and the other application is the *server*. In DDE Server, Analyse-Plus is the *server* and the other application is the *client*.

DDE Send

DDE Send is used to send data files to other applications such as Excel™. You need to know 3 items of information. In the case of Excel™, these are the name of the program ("Excel"), the name of the workbook or sheet and the row/column location where the data should go. The **Help** contains more specific information concerning use of this function. Click **Send** to transmit the data ("one-shot").

Prior to Windows 2000, the Windows operating systems limited the size of transmissions to 64K. Typically, this limit would be encountered when sending 5000 to 6000 samples. The limit can be overcome by sending the data in chunks using the **First Sample** and **Last Sample** fields to send just 5000 samples (approx.) or clicking the check-box at centre-right of this menu. The latter setting breaks the data into chunks automatically but only works when sending data in row/column format (to a spreadsheet).

DDE Receive

DDE Receive is used to receive individual samples or a group of samples (may be an entire file) from other applications. In the case of Excel™, the 3 items of information you need to know are the name of the program ("Excel"), the name of the workbook or sheet and the row/column location where the data comes from.

DDE Receive can receive data in a single transmission ("one-shot") or repeatedly (like sampling). The data you specify is received when you click the **Start Receive** button and whenever the sending application indicates that the data is new (typically when it changes). When transferring data from a spreadsheet, typically the entire data set would be transferred at once. In this case, you would click **End Receive** as soon as the **First Sample** and **Last Sample** fields change (indicating that the transmission has been received). When sampling from an industrial computer (typically over a network), the transmitting computer would typically send one or a few samples at a time at an interval determined by it. The transmitting computer would automatically inform Analyse-Plus when the data is new. If you wish to have the data sent at an interval independent of the update time of the data, click on **This Source** and enter a different item. This would typically be a sampling trigger, a counter or a clock.

In either case, enter the DDE information in the **DDE Receive** window, enter the filename where the data will be saved, click **Start Receive** to begin reception and click **End Receive** when all the desired data has been received. You can then specify a path for the new data file by clicking **Save** from the **File** menu.

DDE Server

DDE Server, when activated, stands ready to automatically fulfill requests for data from other applications (*clients*) running on the same computer or over a network.

To use this, you need to know the following information (enter or configure into the *client* application):
The *Service* is *APLUS*.
The available *Topics* are:
System
Specific File
Collection Status
Each of the Topics has several *Items*. See the **On-Line Help**.

Generally, you first click on **DDE Server** in the **File** menu. Click the **Activate** button of any or all of the topics you wish to make available to the client. Minimize the window. The Server will remain active until you

click on the **OK** or **Cancel** buttons. The client must be configured or programmed to inquire with a valid *Service, Topic* and *Item*.

The System Topic provides a list of available Topics (the remaining 2 above) plus all of the filenames in the Quick List. The Specific File Topic transmits a data file. The filename can be specified by the user by clicking the **Modify** button. A client can also *poke* the Specific File Topic to specify the filename. By using the filenames provided in the System Topic, and poking the Specific File Topic, a client could read all of the data files in the Quick List.

The Collection Status Topic provides detailed information about the progress of the current data collection (with the DataLogger CVF2, if purchased). Once the client determines that the collection has ended, the client can use the Specific File Topic to read the new files containing sampled data.

The above information provides only an introduction to DDE in Analyse-Plus. The **On-Line Help** contains the necessary detail to operate it.

Add-Ons

Some software items are optional. They can be purchased when you purchase Analyse-Plus or at a later date. At printing time, these options were built into the software. Therefore, they can be enabled at any time by changing the software serial number that Technical Support will provide after purchase.

Currently, 3 options are available:
Import Bailey CLS (text data collection files from a Bailey DCS).
Import QMM (data collection files from a Metso Damatic DCS).
MatLab .m file (import .csd files to MatLab)

The first two options are intended to automate the process of importation, which could otherwise still be done using **Import From ASCII** in the File menu. They can save substantial time.

The third option is useful to MatLab users who wish to import Analyse-Plus .CSD data files into MatLab. This package includes a matlab script ".m" file and a .txt file for documentation.

See the **On-Line Help** for more information.

A Technical Support and Warranty

This product includes a two year limited warranty and one year of unlimited technical support. (Additional years of technical support can be purchased.)

Warranty Terms

The product consists of the items listed in Chapter 1 "Checking Your Package". Givens Control Engineering Inc. warrants that the product, exclusive of the internal battery, will be free from defects in material and workmanship for a period of two (2) years from the date of shipment. Givens Control Engineering Inc. warrants that the internal battery will be free from defects in material and workmanship for a period of one (1) year from the date of shipment. To the maximum extent permitted by applicable law, Givens Control Engineering Inc. disclaims all other warranties, either express or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose.

No warranty is expressed or implied for products damaged by accident, abuse, misuse, natural or personal disaster, or unauthorized modification.

The entire liability of Givens Control Engineering Inc. shall be, at its option, to repair or replace the product or portions of the product that do not meet the limited warranty described above. Shipment from the customer to Givens Control Engineering, including the cost of shipping fees, taxes, duties and customs fees are the responsibility of the customer.

Product returned for warranty or non-warranty service should be shipped to:
GIVENS CONTROL ENGINEERING INC.
2173 Bonfield Ct., Burlington, ON,
Canada L7P 2W7

One of the following should be included with the shipment:

- the software serial # (click **Help** and **About Analyse-Plus** from the main window menu, or
- the hardware serial # (displayed when you click the **Connect** button

on the main window).

Before shipping the unit, make sure that the problem cannot be solved by other means. Contact Technical Support and provide the information listed below.

Important: Product shipped to Canada from other countries should be labelled (on the shipping box) "Returning to Manufacturer for Repair/Warranty". If shipping from the USA or Mexico, also mark "Made in Canada from NAFTA parts".

Technical Support

This product includes one year of unlimited technical support. (Additional years of technical support can be purchased.)

Before calling technical support, make sure you have the following information available:
1) One of the following:
- the software serial # (click **Help** and **About Analyse-Plus** from the main window menu, or
- the hardware serial # (displayed when you click the **Connect** button on the main window).

2) The operating system you are using; e.g. Windows XP
3) Computer Model, processor type and speed.
4) Size of installed RAM memory in the computer.
5) A **complete** description of the problem, including what is displayed on the screen when the problem occurs and what is necessary to recreate the problem.

You may also be asked to email or fax the contents of the Analyse-Plus configuration file. The file is called DLPAxxx.CFG where xxx is the version number (e.g. DLPA401.CFG). It is in the installation directory (normally C:\APLUS401). It is an ASCII (text) file and can be printed directly.

You may contact Technical Support by fax, phone, email (internet) or mail.

GIVENS CONTROL ENGINEERING INC.
2173 Bonfield Ct., Burlington, ON,
Canada L7P 2W7
Phone: (905)-631-8293 Fax: (905)-631-8761
email: support@givenscontrol.com

B DataLogger CVF2 Specifications

Interface: Parallel (printer) port of a PC AT™ or PS/2™ compatible computer.
Isolation of Signal Inputs (continuous): 1500 VDC, 1000 VAC RMS
Over-voltage Protection (continuous):
Voltage Ranges: 300 VDC, 300 VAC RMS
Current Ranges: 350 VDC, 250 VAC RMS (sine)
Input Impedance Powered On:
Voltage: 10 MOhms,
Current: 250 Ohms approx.,
Frequency: 2 MOhms.
Input Impedance Powered Off:
Voltage: 68 KOhms,
Current: 250 Ohms approx.,
Frequency: 68 KOhms.
Current Input Open-Circuit Threshold: 80 mA.
Number of Channels: 8 differential analog (voltage or current), 1 frequency.
Analog Input Ranges: 0 to 20 mA, 0 to 10 V, 0 to 2 V, 0 to 500mV, 0 to 100 mV, -5 to 5 V, -1 to 1 V, -250 to 250 mV, -50 to 50 mV.
Frequency Input Range: 0 to 30 KHz.
Frequency Channel Trigger Levels (approx.): 150 mV, 1200 mV.
A/D Resolution: 16 bits — (0.0015 % of range).
Sample Rate:
Maximum: 1000 samples per second per channel.
Minimum: 1 sample per 49.7 days per channel.
Maximum Number of Samples: 242688 (512K RAM) or 111616 (256K RAM) in on-board memory divided among active channels. 4.29 billion per channel when streaming continuously to disk.
Sampling Synchronicity: Simultaneous
Collection Start Triggering: Any 1 to 3 channels with configurable Pre-Trigger Advance or Post-Trigger Delay with AND, OR, SEQUENCE or LATCH operation.
Analog (Hardware) Filters (Analog Channels): 2
Fixed 4 pole, 500 Hz cut-off for anti-aliasing.

Attenuation (amplitude):	
	500 Hz 34%
	600 Hz 76%
	1000 Hz 94%

2000 Hz 99.75%

Selectable 1 pole, 4 Hz filter for voltage ranges of 0.5 V or less.

Attenuation (amplitude): 4 Hz 29%
40 Hz 93%
60 Hz 95.3%.

Digital (Software) Filter: For anti-aliasing. Variable from 0 to infinity in 65535 steps. Filtering takes place every 1 msec — after the sampling at 1 msec intervals and before digital sampling to the user's sample period.

Range, Analog Filter, Frequency Trigger Selection: Software selectable. No jumpers or switches.

Physical:

Weight: 5 lb, 2.5 Kg.

Dimensions: 12" X 9.5" X 3.5", 30 cm X 24 cm X 9 cm.

Built-In Battery — Units Sold After Jan 1, 2009 (SN 1114399 and higher):

Type: Lithium-Ion. (Does not need to be discharged before charging — no memory effect).

Switching — Discharging/Charging/Idle: Fully Automatic. No user intervention.

Capacity When Fully Charged: 10 hours of operation.

Charging Time:

Powered Off : To 100 % Linearly: 8 hr

Powered On: To 100 % Linearly: 14 hr

Built-In Battery — Units Sold Before Jan 1, 2009 (SN 1114398 and lower):

Type: Lead-Acid Gel. (Does not need to be discharged before charging — no memory effect).

Switching — Discharging/Charging/Idle: Fully Automatic. No user intervention.

Capacity When Fully Charged: 4 hours of operation.

Charging Time:

Powered Off : To 66 %: 2.5 hr To 100 %: 14 hr

Powered On: To 66 %: 4 hr To 100 %: 16 hr

Calibration: Automatic calibration of input ranges for each channel (with user-supplied reference signal). The software to perform the calibration is not included in **Analyse-Plus**. Calibration parameters are stored in on-board EEPROM.

Power Supply: 115 VAC Adapter, CSA/UL Approved. 230 VAC Adapter available as an option. With optional plug, an external DC supply can be connected instead (18 to 25 VDC for units sold after Jan 1, 2009 or those whose battery was upgraded to Li-Ion, 11.5 to 25 VDC for older units).

Ports: 1 parallel I/O port for communication to computer. 1 parallel

Print-thru port that connects to a printer to allow printing from the computer before, during or after collection.

Signal Input Connections: Terminal block.

Analog Channels: Positive voltage, Common, Positive current.

Frequency Channels: Line 1, Line 2

Visual Indicators: 5 LEDS: AC Power, Battery in use/Battery low, Print-thru enabled, Collecting, Collection finished.

Case: Impact resistant plastic case with handle.

Principal of Operation: Microprocessor based.

Warm-Up Time: 10 minutes.

Operating Temperature: 0^{o} to 40^{o} C, 32^{o} to 104^{o} F.

Humidity: 80% maximum, non-condensing.

Although this information is believed to be accurate, we reserve the right to make changes without notice.

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