Advantech GeniDAQ User's Manual

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About This Manual

Advantech GeniDAQ is a comprehensive, flexible human machine interface application environment, that supports the functions and utilities to develop all types of automation applications in the Windows NT, Windows 98/95 and Windows CE environment. GeniDAQ provides an icon-based, mouse driven system for designing real-time Automation and Control Strategies, System Monitor Displays, and Dynamic Operator Displays.

Organization of this Manual

- Chapter 1, *Introduction* gives a general background to the GeniDAQ application builder. The system architectures is explained, and the products main features are introduced. Installation of the software is explained, followed by a quck start to completing some of the most common tasks within GeniDAQ.
- Chapter 2, *Tutorial* explains how to complete the basic skills that you need to use the GeniDAQ software. In addition, there are nine step-by-step tutorials that explain how to complete simple strategies within the GeniDAQ application builder software.
- Chapter 3, *Configuring Your System Functions With Task Designer* explains the basics on how to use the GeniDAQ Task Designer. The basic skills for designing tasks is followed by an introduction to the task blocks that are available to you.
- Chapter 4, *Configuring Your Display View With Display Designer* explains how to use the GeniDAQ Display Designer to create a user interface for your strategy. It introduces all of the display objects that are available within the Display Designer.
- Chapter 5, *Connecting Your Devices* explains how to configure GeniDAQ to use your hardware. In addition to using the Advantech DLL Drivers to enable your Advantech hardware, this chapter covers the OPC Standard Interface, Analog Input, Analog Output, Digital Input, Digital Output, Temperature Measurement, Counter/Frequency Measurement/Pulse Output, Hardware Alarm and RS-232 communication.
- Chapter 6, *Historial Trending System* explains how to use the historical trend display control to view past data. It also covers saving data to a text file so that you can recall it later.
- Chapter 7, *Monitoring Alarm and Event* explains how to configure the alarm log block and use the alarm system at runtime.
- Chapter 8, *Communicating Through TCP/IP Networking* explains how to use the GeniDAQ's new support for the TCP/IP network protocol. In addition, this chapters provides step-by-step information for setting up your Windows 95/98/NT environment to support TCP/IP.
- Chapter 9, *Runtime and Security System* explains how to use the GeniDAQ runtime to run your strategies. Topics include setting password security, how to log-in and log-off during runtime and how to work with the display control object at runtime.
- Chapter 10, *Advanced BasicScript Programming For Your Specific Needs* explains how to use the BasicScript support that is embedded within GeniDAQ. In addition to using the debugger to help you write your scripts, all of the BasicScript commands, methods and statements are introduced.
- Chapter 11, *Sharing Real Time Data with Data Center* explains the concept of the data store, their data structures and the tags available for using the Data Center. In addition, the DDE interface and OLE automation are introduced.
- Chapter 12, *Advantech GeniDAQ WinCE for HMI-64S* explains how you can build a GeniDAQ application on your 32-bit Windows machine and then copy it to Advantech's HMI-640S Windows CE device. You can transmit information from the HMI-640S to your host computer via TCP/IP networking.
- Appendix A, *Runtime Error Code Listing*
- Appendix B, *Glossary*
- Appendix C, *ADAM OPC Server* explains how to use the ADAM OPC Server which is a driver for both the OPC Client test function and as a real working ADAM-4000, ADAM-5000/485 data acquisition and control module OPC Server.
- Appendix D, *Serial ModBUS OPC Server* explains how to use the Advantech ModBus RTU OPC Server to communicate with OPC clients and control devices.

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1

Introduction

Overview

Congratulations on your purchase of Advantech's application builder for developing human machine interfaces — Advantech GeniDAQ.

Advantech GeniDAQ is a comprehensive, flexible data acquisition application environment, that supports the functions and utilities to develop all types of automation applications in the Windows NT, Windows 98/95 and Windows CE environment. GeniDAQ provides an icon-based, mouse driven system for designing real-time Automation and Control Strategies, System Monitor Displays, and Dynamic Operator Displays.

The package is extremely flexible and easy to use. A library of icon blocks representing data acquisition and control, industry standard mathematical and control functions is provided to you through the *Task Designer*. You simply arrange icon blocks into a strategy, connect them, and then draw your Dynamic Display. Display Designer provides lots of graphic objects to design monitoring and control pictures. In addition to being easy to use, GeniDAQ built-in BasicScript programming tools to strengthen the ability to design complex calculation or analysis.

In addition, Advantech GeniDAQ leverages 32-bit Windows' preemptive multi-tasking capability to support Windows NT, 98/95, and Windows CE environments. The GeniDAQ kernel is a multi-threaded engine for optimal performance. It provides you a secure industrial and real-time environment for your applications.

Advantech GeniDAQ also provides an open development environment. You can easily communicate with other applications through DDE, OLE Automation, and TCP/IP networking. For database connectivity, there are embedded ODBC functions for SQL access to a wide range of databases. GeniDAQ's open architecture design ensures that you can integrate your process data into existing enterprise information systems throughout your company. Moreover, GeniDAQ leverages the industry's OPC standard to provide plug-and-play connectivity with your devices, including programmable logic controllers (PLCs).

Advantech GeniDAQ supports different sized HMI models, from 5.7" inch to 15" inch, and different operating systems from Windows NT, 98/95 to Windows CE. GeniDAQ is all you need to build your front panel. It saves a lot of effort and time when developing your applications.

For convenience, Advantech GeniDAQ is used interchangeably with GeniDAQ throughout this manual.

Contents

- System architecture
- What's new in Advantech GeniDAQ 4.0
- Installation
- How does GeniDAQ work
- Quick Start to GeniDAQ
- Compatibility and Upgrade Information
- Summary

System Architecture

We designed GeniDAQ with a multi-threaded, modular-oriented, and open integrated architecture. The open platform allows you to easily integrate GeniDAQ with other applications to share real-time control data. The performance and number of I/O blocks GeniDAQ can support are increased significantly through this new architecture. The new architecture is outlined in Figure 1-1.

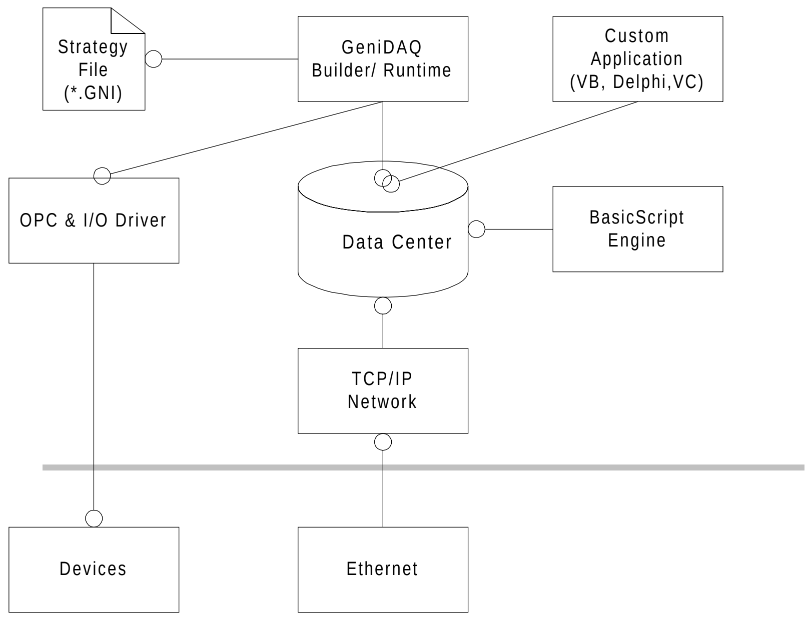


Figure 1-1: GeniDAQ System Architecture

Module Description

GeniDAQ Builder

GeniDAQ Builder is application development software that allows users to create their HMI applications. The development environment includes task, display and script configuration. It also provides running mode for verifying the configuration. GeniDAQ Builder provides an intuitive object-based graphical user interface (GUI) that simplifies control strategy and display setup. You simply select icon blocks from the toolbox, connect them, configure the parameters, and draw your dynamic display without any programming.

GeniDAQ Runtime

GeniDAQ Runtime provides runtime execution environment for GeniDAQ application. It doesn’t allow any change to be made to the application.

BasicScript Engine

The BasicScript engine is a set of DLLs that facilitates the compilation of script source at build-time and execution of scripts at runtime. Based on the world’s most popular macro language, Microsoft Visual Basic for Applications, over 600 commands are available to perform any function you can imagine, including calculations, reading and writing files, DDE and ODBC. It also allows you to access and share data with other applications, such as Microsoft Access and Microsoft Excel.

OPC (OLE for Process Control) Client

This is responsible for connecting OPC-enabled devices. Through the standard and high performance driver interface, GeniDAQ can easily integrate your systems.

TCP/IP Network

This is responsible for communication with multiple GeniDAQ nodes. GeniDAQ's networking capability allows a computer in the control room to display data being collected by computers on the factory floor, or vice versa, through the TCP/IP protocol.

Data Center

Data Center is the central repository for data acquisition and control data. It manages all of GeniDAQ's real-time data and provides two sets of interfaces to the outside world; DDE and OLE Automation. Through these two interfaces, other applications can retrieve or input data to GeniDAQ.

I/O Driver

This is responsible for accessing real-time data from hardware. GeniDAQ I/O drivers covers all of Advantech's industrial automation hardware, including plug-in DA&C cards, PC-based modular controller MIC-2000, ADAM-4000 remote I/O modules and ADAM-5000 distributed I/O modules.

What's New in Advantech GeniDAQ 4.0

GeniDAQ 4.0 includes the following new features:

Multi-threaded Engine

GeniDAQ takes maximum advantage of Windows' multi-tasking capabilities to enhance your system performance. It speeds up the task scanning by separating time-consuming display drawing from I/O scanning and raising the scan priority of tasks, no matter how complex your display is. In addition, it provides parallel scan for each task. It results in more efficient task scanning for independent I/O, such as COM port devices with long response times. Moreover, because of independent task scanning, it will not affect the system safety if one task fails. You can also prioritize your tasks to meet time-critical operation and optimize your system performance. Finally, its multitasking design will not block off the task scanning or display update when operating your user interface, such as holding on the window. All of these provide you a secure and real-time industrial environment for your applications. Please refer to the Task Designer chapter for the details.

OPC Client Support

In your plant or system, there may already be some devices in addition to Advantech I/O cards. GeniDAQ leverages the industry-standard OPC architecture to provide plug-and-play connectivity with your devices, such as programmable logic controllers (PLCs). Most major PLC vendors provide the OPC servers for their hardware. With OPC, you can easily create a data acquisition application that covers your equipment, not just Advantech devices. GeniDAQ seamlessly integrates OPC client function in I/O blocks. It allows you to browse the pre-defined tags in the OPC server, and you only need to click on the item that you want to access. Please refer to *Chapter 5, Connecting Your Devices* for the details.

TCP/IP Networking Capability

GeniDAQ's networking capability allows a computer in the control room to display data being collected by computers on the factory floor, or vice versa. This means that data and field processes can be viewed or monitored in real-time from anywhere on your network. GeniDAQ implements a network system that supports peer-to-peer communication using the TCP/IP protocol. It allows networking status to be logged and viewed for network monitoring and maintenance. In addition, it also provides browsing functions to configure remote tags for network input blocks. Please refer to *Chapter 8, Communicating Through TCP/IP Networking*.

Supports Different Sized HMI Models

GeniDAQ allows you to build your front panel interface for different sizes of HMI models from 5.7 inch to 15 inch. You can develop your application on Windows NT or Windows98/95, and then run it on these operating systems or Windows CE. With GeniDAQ, you don't have to buy and learn different application software packages for different models. It significantly reduces your development effort and cost.

New Hardware Support

GeniDAQ is based the 32-bit DLL driver to support Advantech data acquisition and control hardware. Now GeniDAQ supports Advantech PCI-bus data acquisition and control cards. You can also use our OPC servers to link ADAM-5000/CAN I/O modules.

Enhanced Historical Trend

GeniDAQ now can support up to 99 historical trending display objects. The historical trending display object also allows you to go to a specific time and search for a specific value. Other enhancement includes the automatic scrolling during startup, button tooltips for easy operation, and more intuitive historical data conversion. Please refer to *Chapter 6, Historical Trending System* for the details.

Enhanced Virtual Tag with Multiple Data Type Support

GeniDAQ now supports STRING, LONG, and FLOATING POINT data types for virtual tags. It is more flexible to use the virtual tag to keep your data. It allows you to create customized tags and store them in the data center, and then share them with different tasks, and other applications.

Enhanced Save and Restore Functions

In the past, GeniDAQ provided save and restore functions for control objects, including knob, numeric control, slider, button and conditional button. Now this function also supports analog output and digital output blocks. It allows you to save the output values when the system stops and then restore the values to initialize the hardware the next time the system starts.

Security Strategy File

GeniDAQ now provides security protection for your strategy file. You can distribute your application with safety.

User Interface Enhancements

GeniDAQ provide a lot of user interface enhancements, including scrollable display windows for large displays, a dockable toolbox to customize your working style, new menu bar icons for quick configuration and icon tooltips for easy operation. The new user interface enhancements increase your productivity.

Porting Device Configuration to Another Machine

GeniDAQ now allows you to port the device configuration from one machine to another machine. It saves your time by being able to avoid reconfiguring the devices on another machine. You must first export the device configuration from the registry to a *.reg file on one machine. You can then import the device configuration from the *.reg file to the Windows registry on another machine. Please refer to *Chapter 5*, *Connecting your Devices* for the details.

Project Management

GeniDAQ now utilizes project concepts to design your strategies. It allows you to manage and maintain your project more easily. GeniDAQ creates a new directory when you create a new strategy. All files including strategy files, historical data files, exported device configuration files (*.reg) and log files exist in the directory.

New Basic Script Commands

GeniDAQ adds a few new Basic Script commands, including data lock function for multi-threaded protection, overrun message disabling, and querying network status functions. Please refer to *Chapter 10, Advanced BasicScript Programming for Your Specific Needs* for the details.

System Control Block and Event Log Display Item for Version 4.1

GeniDAQ version 4.1 supports two new items: System Control block and Event Log Display item.

OPC Servers for GeniDAQ Version 4.1

GeniDAQ version 4.1 includes two OPC servers, ADAM OPC and ModBus OPC. Please refer to Appendix C and D for further information.

Installation

System Requirements

- OS: Microsoft Windows 98/95, Windows NT 4.0 (SP4 above) or Windows CE (Runtime only)
- RAM: 64 MB memory (minimum)
- Disk space: 20 MB (minimum)
- CPU: Intel Pentium processor 200 MHz or higher
- Display: VGA resolution or higher
- Microsoft-compatible mouse
- Parallel port for software key

Installing Advantech GeniDAQ

GeniDAQ ships with an installation program that helps you install the program to your computer. Installation can normally be completed within five minutes.

1. Run the GeniDAQ installation program at:

```
d:\Disk1\setup.exe
```

where “d” is the drive letter of your CD-ROM drive. The installation program will load and display the GeniDAQ splash screen.

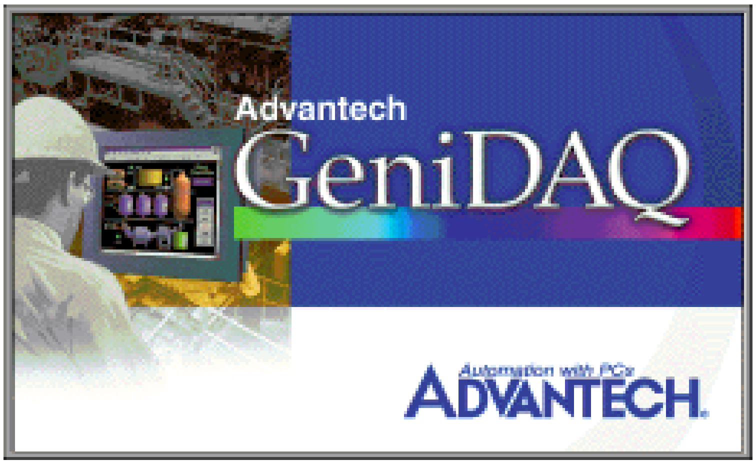


Figure 1-2: GeniDAQ Installation Program Splash Screen

2. The *Welcome* screen loads. Click the **Next** button.

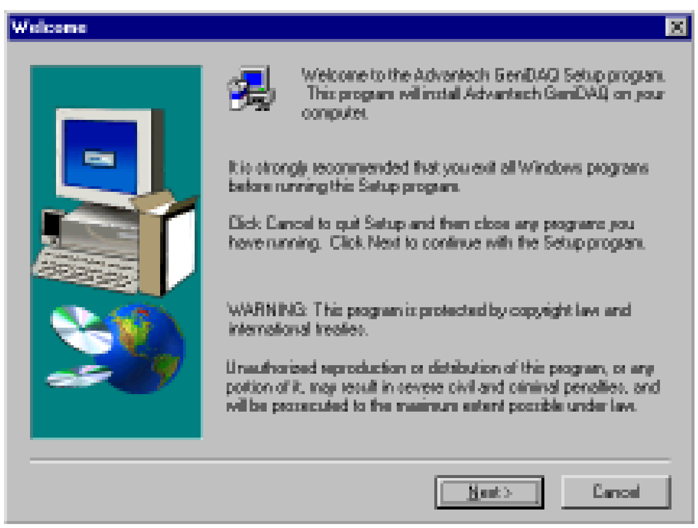


Figure 1-3: GeniDAQ Installation *Welcome* Screen

3. The *Information* screen loads. This document contains important information about GeniDAQ that might not appear in the manual and/or online help system. Read the document and then click the **Next** button to advance.

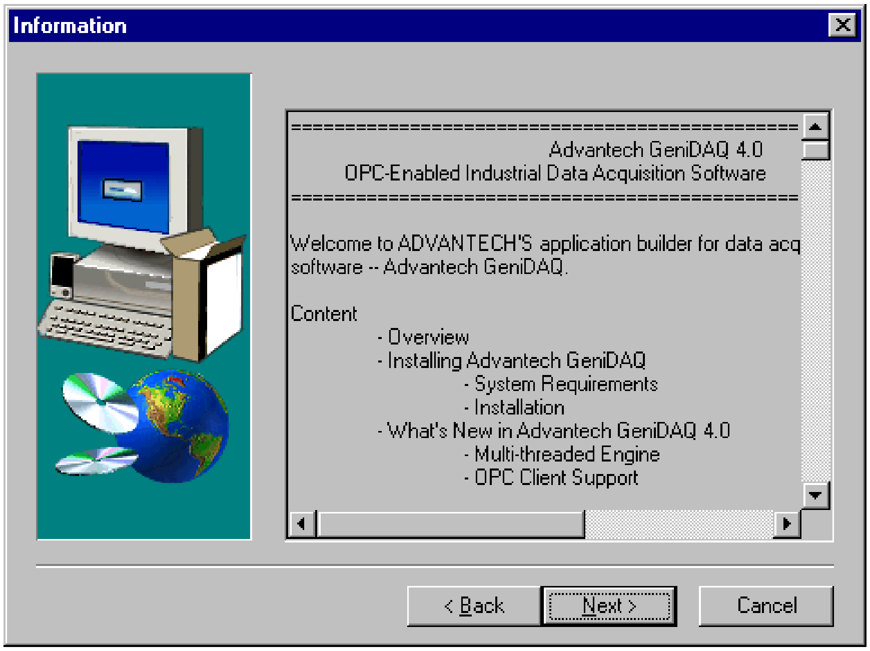


Figure 1-4: GeniDAQ Installation *Information* Screen

4. The *User Information* screen loads. Enter your name and company name.

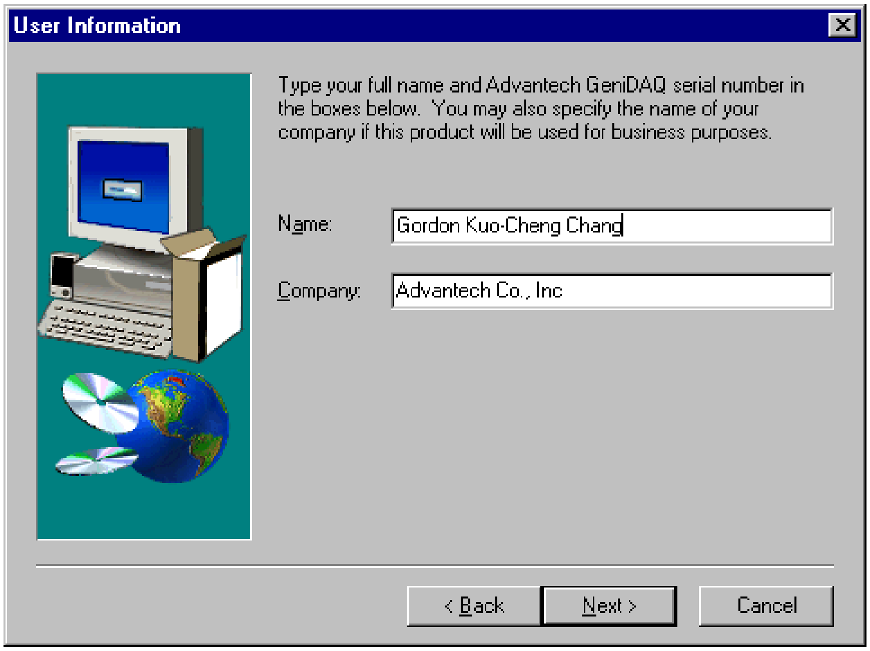


Figure 1-5: Installation Program *Information* Screen

5. Select a location where you want to install the GeniDAQ software in the Choose Destination Location window. The default location is:

    `C:\Program Files\Advantech\GeniDAQ`

6. If you want to select a different path on your computer, click the **Browse** button. Click the **Next** button to advance.

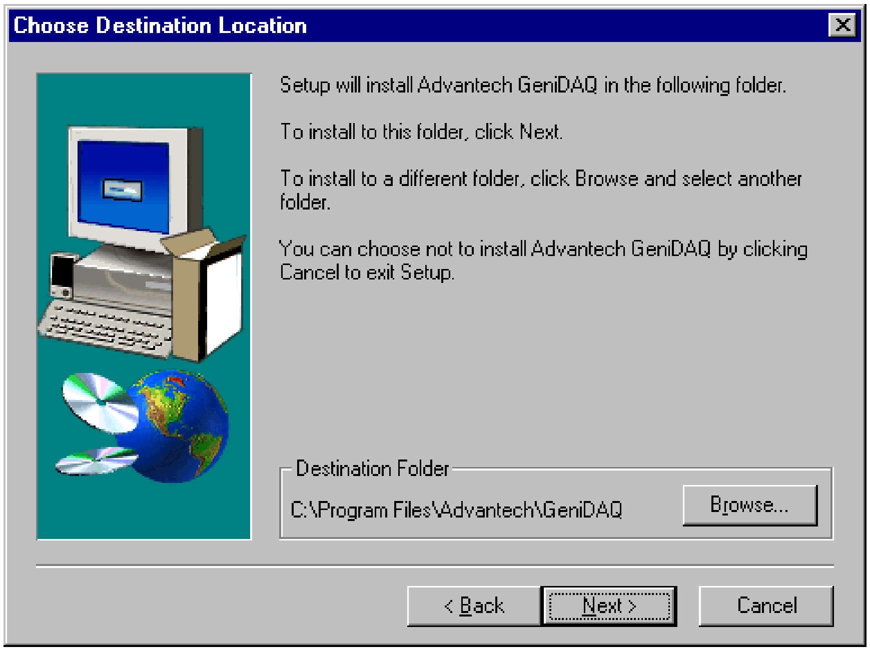


Figure 1-6: Choose Destination Location Dialog Box

7. You can install either the *Full* version of the program that includes the Runtime and Development modules or just install the *Runtime* (Compact) version that only includes the Runtime module. Enable the radio button of the version that you want to install.

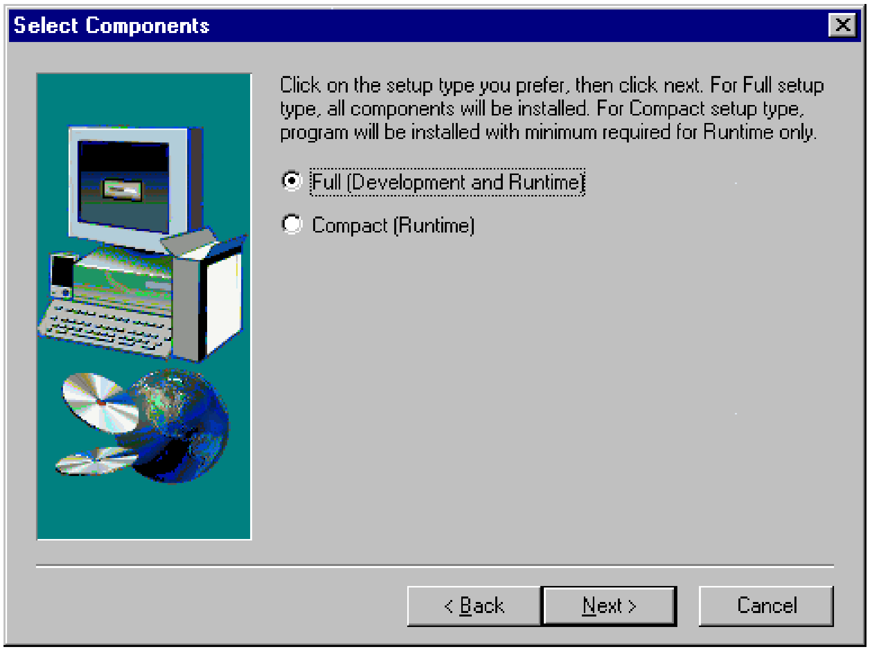


Figure 1-7: Choose to Install the Full or Compact Versions of the Program

8. The installation program will create program shortcuts on your Windows Start menu so that you can easily launch the program. The default program folder is:

   `Advantech GeniDAQ 4.0`

   If you want to have the shortcuts made in a different folder, type it or select it in the *Select Program Folder* dialog box.

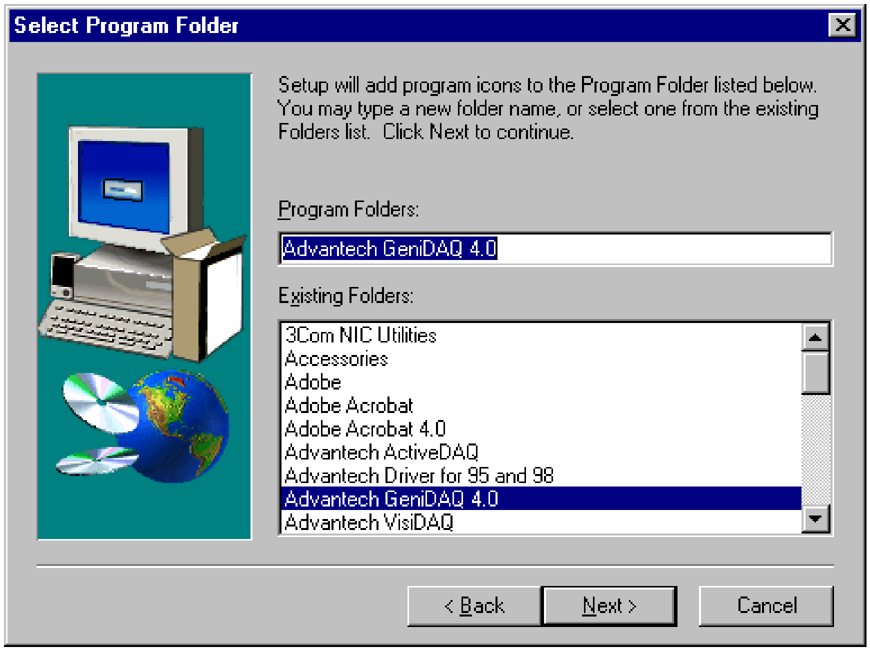


Figure 1-8: Select Program Folder Dialog Box

9. The program will start copying the program files to your computer.

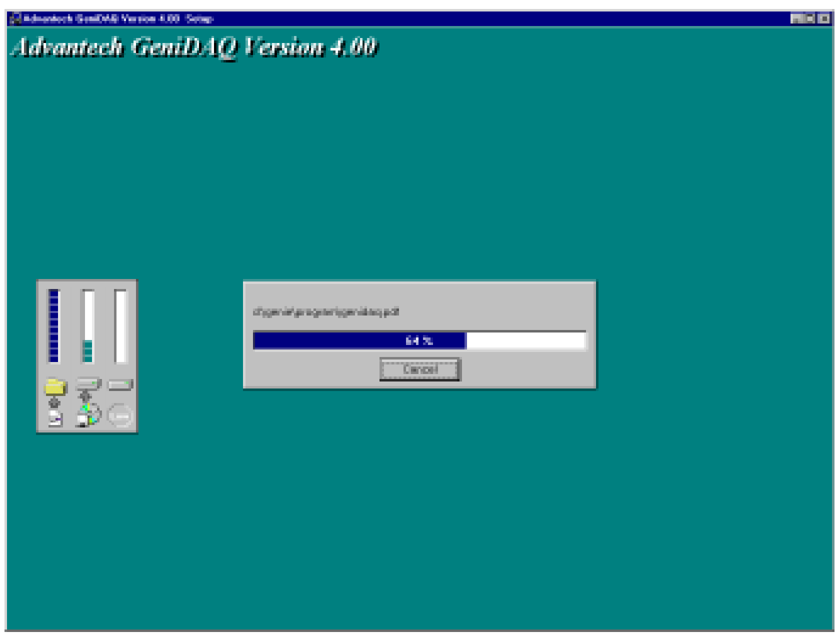


Figure 1-9: Copying Program Files to Computer

10. A message box prompts if you want to set up the shortcuts on the Start menu.

Figure 1-10: Click Yes to Install the Program Shortcuts

11. A copy of the GeniDAQ manual is copied to your computer and a shortcut is set up in the *Advantech GeniDAQ 4.0* folder on your Windows Start menu. The manual is in Adobe Acrobat format - if you want to install the free Adobe Acrobat Reader software, click the **Yes** button in the dialog box.

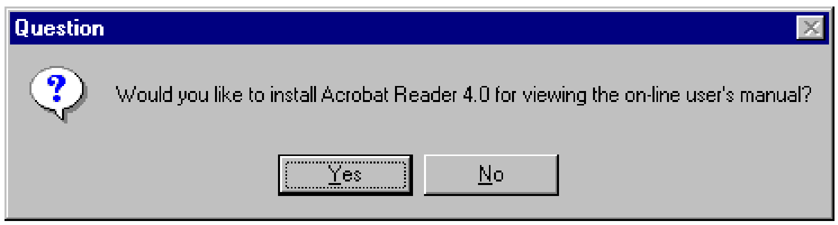


Figure 1-11: Click Yes to Install Adobe Acrobat Reader

12. If the DCOM98 components are not already installed on your computer, the installation program prompts if you want to install them. Answer Yes to the message box.

Figure 1-12: Click Yes to Install the DCOM98 Components

Meanwhile, it will install OPC servers.

13. GeniDAQ is now installed on the computer; however, you must restart the computer before you can start using the program. If you want to immediately restart the computer, select the *Yes* radio button, otherwise click *No*. Click the **Finish** button.

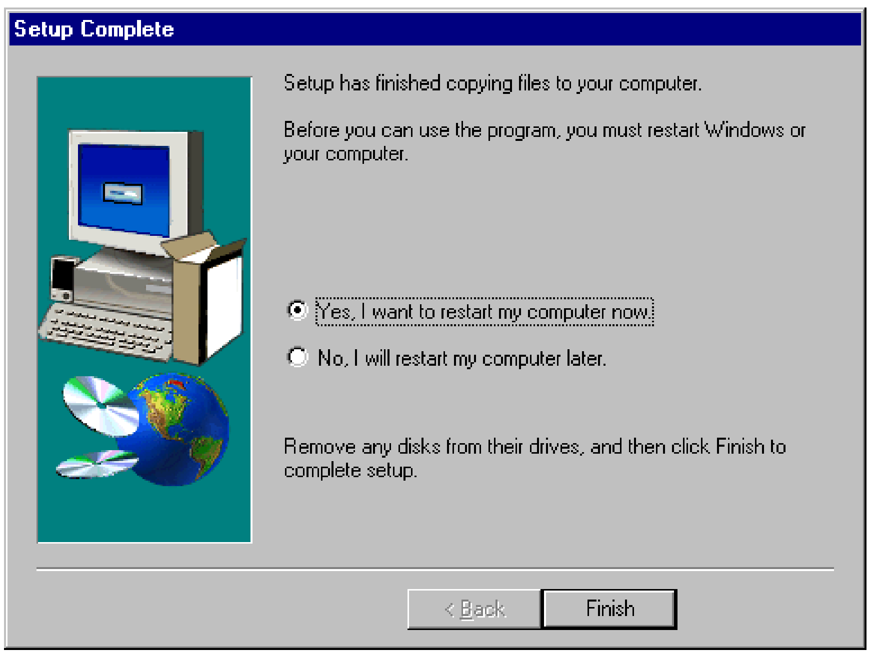


Figure 1-13: Setup Complete Dialog Box

Note: *To run the GeniDAQ program, you first have to install the latest DLL drivers. The DLL drivers are bundled within the installation CD-ROM. If you have not installed the DLL drivers on your system or the version you installed is less than this one, the installation program will start driver installation automatically.*

Note: *For Advantech GeniDAQ CE Runtime installation, please refer to Chapter 12, Advantech GeniDAQ CE WinCE for HMI-640S Platform.*

Inserting the Anti-Piracy Hardware Key (Dongle)

In order to prevent software piracy and minimize costs for our customers, GeniDAQ employs an anti-piracy parallel port key (or “dongle”). After installing the software, you must must insert the hardware key into your computer’s parallel (i.e., printer) port before attempting to start the software. The software program checks for the presence of the dongle during start up, and will immediately close if it does not detect its presence.

If you do not insert the key, you have the option to start a two-hour trial period when the software will function without the key.

Dongle

A dongle is required to run GeniDAQ. If not installed with the dongle, GeniDAQ can only run in demo mode for a limit of two hours. Follow the instructions below to install the key:

1. Power off the computer and all peripheral devices prior to installing the key, since it is sensitive to static electricity.

2. Remove any connections to your computer’s parallel port.

3. Secure the dongle in the parallel port and tighten the screws.

Note: *Do not remove the Advantech GeniDAQ dongle while Advantech GeniDAQ is running. If you do so, Advantech GeniDAQ must be restarted and dongle may be damaged.*

Versions of the Dongle

Advantech GeniDAQ provides four kinds of software keys: Development key for Development edition, Runtime key for Runtime edition and Upgrade key for Upgrade edition and CE Development key for CE Development edition. For the Upgrade edition, you still need to enter the serial number of the old version when you run Advantech GeniDAQ for the first time.

Uninstalling Advantech GeniDAQ

1. Select **Settings | Control Panel** from the Windows Start menu and then double-click the the *Add/ Remove Programs* icon.
2. Select the item *Advantech GeniDAQ Version 4.0* and then click the **Add/Remove…** button.
3. Click the **Yes** button in the *Confirm File Deletion* dialog box.
4. The uninstallation program removes the program files and registry entries from your computer. Click the **OK** button when the uninstallation program finishes.

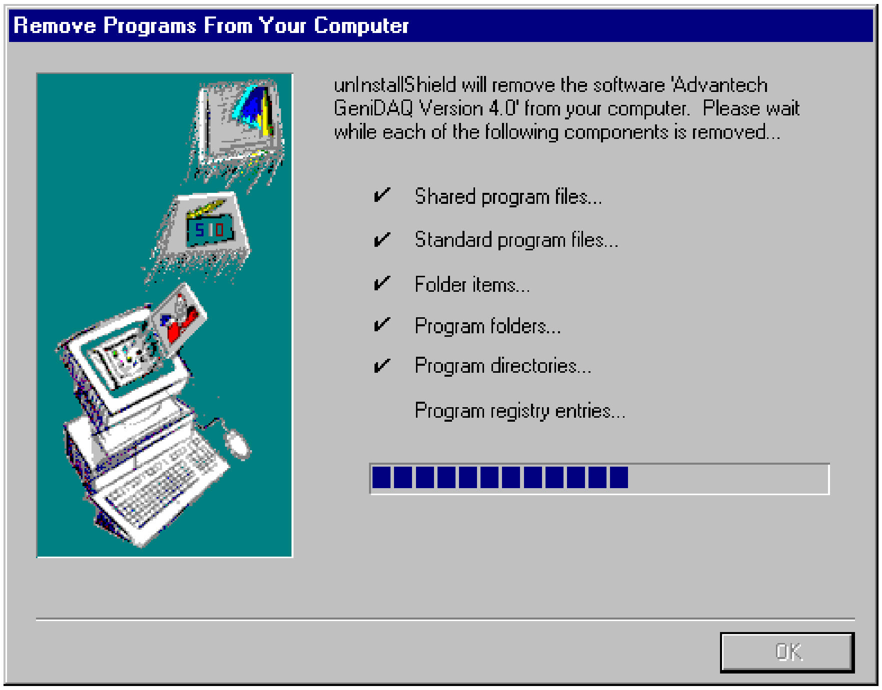


Figure 1-14: Removing GeniDAQ From the Computer

Start Menu Shortcuts

The GeniDAQ installation program creates the following program shortcuts on the computer's Start menu.

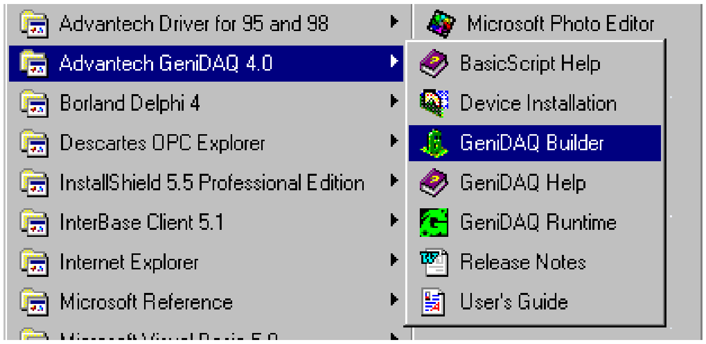


Figure 1-15: GeniDAQ Start Menu Shortcuts

The links are the following:

- *Device Installation*: Install the drivers that enable Advantech hardware
- *GeniDAQ Builder*: Create GeniDAQ tasks and displays
- *GeniDAQ Runtime*: Run your GeniDAQ tasks and displays
- *Release Notes*: View information about the software release, including last-minute program issues that might not appear in the manual or online help system
- *User's Guide*: View on-line GeniDAQ user's guide manual. It is written by Acrobat Reader 4.0.
- *GeniDAQ Help*: View a help file which can be used to quickly access context-sensitive help for your operations.
- *BasicScript Help*: View a help file which describes the BasicScript function and program syntax.

How Does GeniDAQ Work?

GeniDAQ development system, GeniDAQ Builder includes three different editors: *Task Designer*, *Display Designer* and *Script Designer*. They are used to edit Tasks, Displays and Main Script respectively. Because there can be multiple tasks in one strategy, you can create multiple *Task Designer* windows inside GeniDAQ. For the same reason, you can create multiple *Display Designer* windows for editing multiple displays. In any application there can be only one main script. Therefore, only one *Script Designer* window can be opened. GeniDAQ can have many other types of script, which will be described in Chapter 10, *Advanced BasicScript Programming For Your Specific Needs*.

A task is a collection of icon blocks. A display is a collection of display items. Icon blocks and display items are the building blocks of a strategy. You can see them as similar objects, except that display items have a graphic representation (provide some kind of GUI) when running while icon blocks do not. They are connected to each other by connection wires or invisible links. The connections between icon blocks are visible in the Task Designer window. The links are referred to as "wires" because of their appearance. The connection between an icon block and a display item, or one display item and another, is not visible. Hence, these are referred to as "Links".

Each task and display has its own properties. When first created, default properties are assigned to the new task or new display. Users can change properties according to their needs. A task has properties such as scan period, sample rate, starting method and stopping method. A display has properties such as display name, visibility, etc.

Any number of blocks and I/O devices can be used at one time, limited only by your system's speed and memory. It is suggested that the number of software icon blocks not exceeded 1024 and I/O blocks not exceeded 512. Otherwise, system performance may be adversely affected. From small applications interfacing only a few blocks, through full-scale industrial process control systems running many I/O Devices simultaneously, GeniDAQ provides you with the quickest and most efficient HMI solution.

The following overviews the basic concepts and editing tools for developing your applications with GeniDAQ.

Project

GeniDAQ utilizes project concept to design your strategies. It allows you to manage and maintain your project more easily. GeniDAQ creates a new directory when you create a new strategy. All files including strategy file, historical data files, exported device configuration file (*.reg), and log files exist in the directory.

Strategy

The design work in GeniDAQ is saved as a strategy file. A strategy file (with extension .GNI) is a binary file that stores all information about an editing session. A strategy is defined as one or more "tasks" together with one or more "displays" and one or no "main script". "Task", "Display", and "Main Script" are the three primary elements used to design strategies. To protect your design work, GeniDAQ provides security protection for your strategy file. You can distribute your application with safety.

Task Designer

The Task Designer is to configure the task functions, such as I/O function, DDE function, calculation function, file function, etc…These functions are represented as function blocks or icons. GeniDAQ uses a data flow programming model to describe your task and control strategy. You intuitively construct and connect the function block icons to build your system. In addition, GeniDAQ features block sequence arrangement functions that determine the order of execution of blocks in a task. Users can change the execution order of the blocks according to the needs of the system.

GeniDAQ development environment allows you to decompose your system into several smaller modules or tasks. The modular design is very useful to develop and maintain a large and complicated system more easily. Each modular or task has its own properties, such as scan rate, start/stop method, and priority etc. With 32-bit Windows' multi-tasking capability, all tasks are running simultaneously at run time. Moreover, GeniDAQ allows you to prioritize your tasks to increase overall performance.

Display Designer

The Display Designer is to configure the display view or operator interface. GeniDAQ provides a wide variety of graphical wizards, allowing users to quickly create an intuitive user interface. The built-in display objects include bar graph, button, indicator, real-time trending, historical trending, knob, analog meter, slider, imported bitmap, numeric display and control. The historical trending display allows you to scroll backward/forward, go to a specific time, search a specific value, and convert historical data to a text file.

In addition, GeniDAQ also provide graphic tools to draw rectangles, circles, segments, and polygons.

These objects or cells can be link to a tag value. They can change color according to the tag value. They can also be grouped together to make a single object. You can use them to draw pumps, valves or other industrial symbols.

Script Designer

The Script Designer is essentially a text editor for editing script code. Based on the world's most popular macro language, Microsoft Visual Basic for Applications, GeniDAQ integrates a powerful programming tool BasicScript, helping you to develop complex applications. Over 600 commands are available to perform any function you can image, including calculations, reading and writing files, DDE and ODBC. It also allows you to access and share data with other applications, such as Microsoft Access and Microsoft Excel. With the scripting language, it allows you to reuse existing code and build your applications more faster and easier.

The Script Designer supports the cut, copy and paste functions, just like the Visual Basic development environment. It also provides debugging capabilities including the ability to step and trace code, set break points and debug variables, structures and arrays. In addition, the script source will be compiled into p-code so it will not need to be compiled again at run-time.

Multi-threaded Runtime Engine

GeniDAQ takes maximum advantage of Windows' multi-tasking capabilities to enhance system performance. It speeds up the task scanning by separating time-consuming display drawing from I/O scanning and raising the scan priority of task, no matter how complex your display is. In addition, it provides parallel scan for each task. It results in more efficient task scan for independent I/O, such as COM port devices with long response time. Moreover, because of independent task scanning, it will not affect the system safety if one task is failed. You can also prioritize your tasks to meet time-critical operation. Finally, as multitasking design, it will not block off the task scanning or display update at operating your user interface. All of these provide you the industrial secure and real-time environment for your applications.

There are three kinds of scheduling timer during GeniDAQ runtime execution. The first one is the I/O polling time. It is different for internal I/O drivers and OPC servers. For internal I/O drivers, the polling time is based on the task's scan time. On the other hand, the polling time for OPC servers is the update rate configured in the OPC settings of the task property. The second one is the task's scan time that represents the time interval between the scans of a task. Each scan will update all blocks in a task. Each task has its own scan time that is configured in the task property. The last one is the screen's refresh period configured in the Runtime Preference under Setup menu. The display update is based on the refresh period. However, it only updates the display items with input changed. Because of the multi-tasking characteristics, all of the scheduling timers are executed independently and simultaneously. The relationship between these scheduling timers is shown below.

Quick Start to GeniDAQ

As a quick introduction to using GeniDAQ, complete the following procedure to run one of the demonstration strategies that was copied to your computer's hard disk drive during the software installation.

1. Launch the *Device Installation Utility* by selecting **Add | Devices** from the main menu. Alternatively you can click the **Add Devices** toolbar icon which is available in both the *Task Designer* and *Display Designer*.

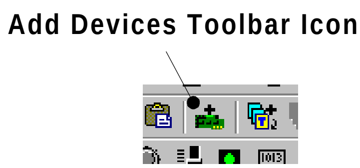


Figure 1-16: The Add Devices Toolbar Icon

2. The *Advantech IO Device Installation* windows loads:

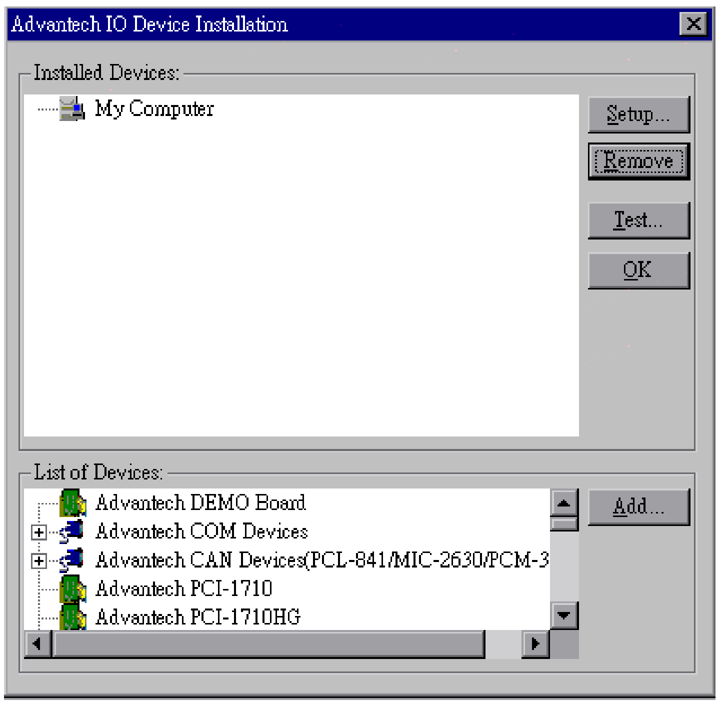


Figure 1-17: Device Installation Utility Main Screen

The *Installed Devices* pane displays the Advantech hardware that is currently set up to run on your computer. The *List of Devices* pane shows Advantech hardware for which the drivers can be installed to enable their use.

3. Highlight the *Advantech DEMO Board* entry in the *List of Devices* pane and click the **Add…** button. A configuration dialog box is displayed to configure the device that you are adding.

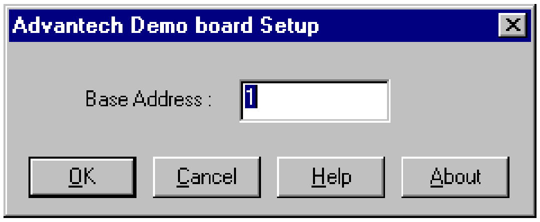


Figure 1-18: Device Configuration Dialog Box

4. Use the default value and press the **OK** button. You will see a new entry in the *Installed Devices* list.

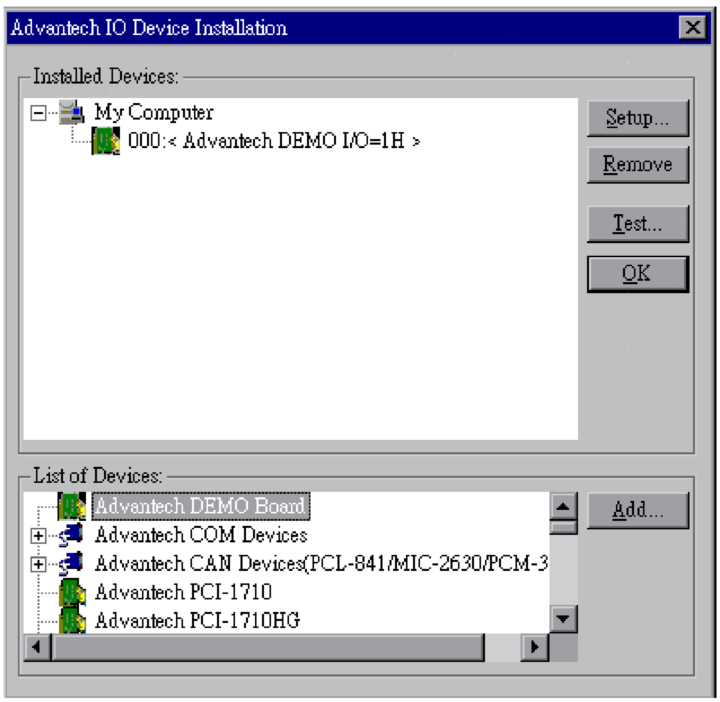


Figure 1-19: I/O Device Installation Dialog Box Showing New Device

5. If you want to test the device that you have just installed, click the device entry in the *Installed Devices* pane and then click the **Test…** button.

6. Click the **Close** button and exit the *Device Installation Utility*.

7. Select **Programs | Advantech GeniDAQ 4.0 | GeniDAQ Builder** from your Windows Start menu.
8. The GeniDAQ Builder application opens. Select **File | Open** from the GeniDAQ Builder's main menu.
9. Select \Strategy\Alarm\alarm.gni from the folder where you installed the GeniDAQ program.

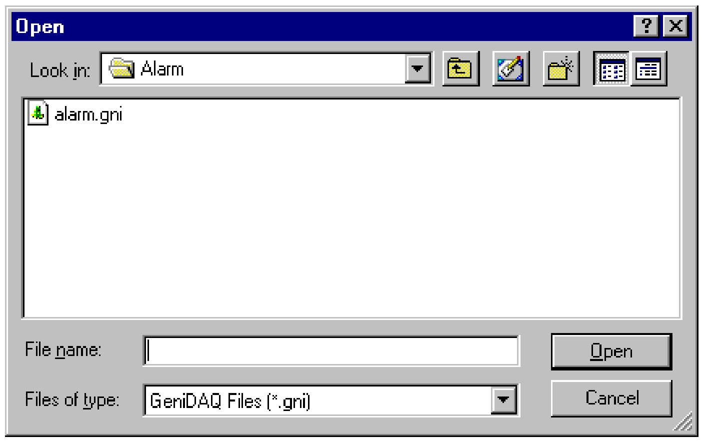


Figure 1-20: Open the Alarm.gni Strategy

10. The strategy loads and you will see the strategy's blocks on the *Task Designer* configuration window.
11. Click the Run menu command to run the strategy file.

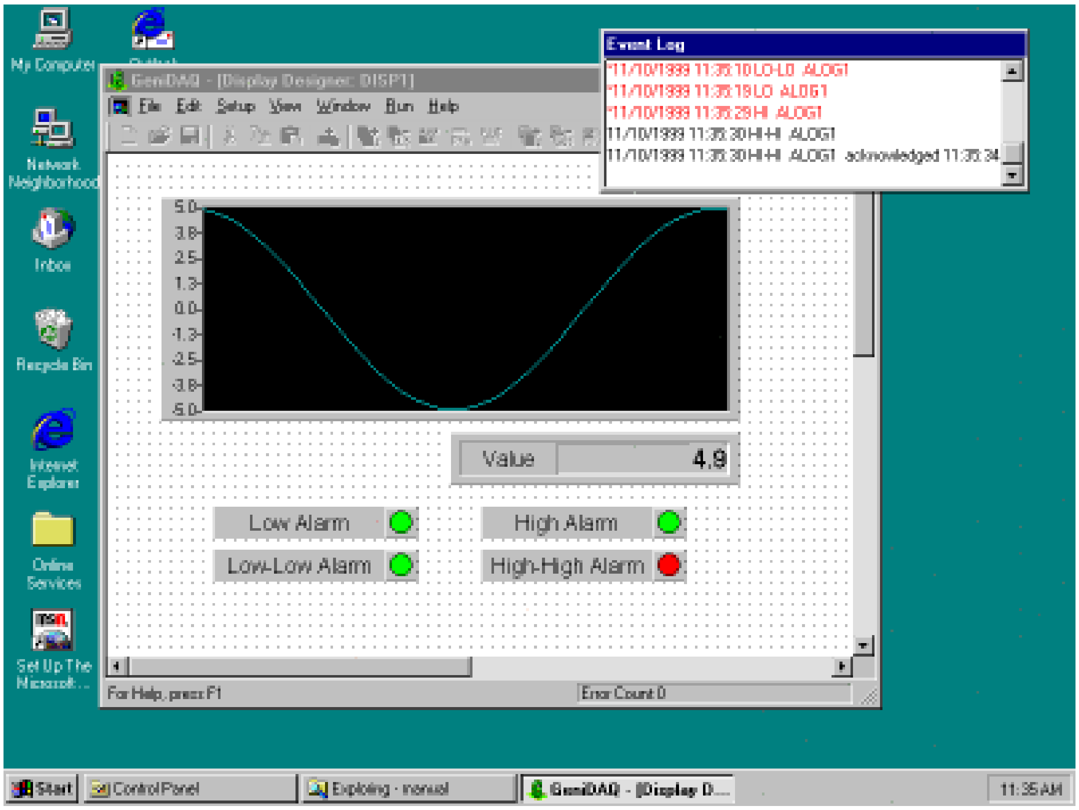


Figure 1-21: Running Alarm.gni

Compatibility and Upgrade Information

This version allows users to load the old strategy files and save them into the new format. However, since this version supports multi-tasking operating system that is very different from the previous one, it can not guarantee that the previous strategy file will run normally in this version, especially for the strategies with multiple tasks. Also this version removes the function blocks, including user programming block, user-defined DLL icon, network output block, and report designer. After you save the old strategy files into the new format, these blocks or functions will be discarded.

Summary

The GeniDAQ application software combines icon-based graphical development and the flexibility of a powerful programming tool, BasicScript. With GeniDAQ, you can easily develop both simple and complex applications. Types of applications include process and utility monitoring, data acquisition and control, factory automation, and test and measurement.

GeniDAQ is a multi-threaded, modular-oriented, and open integrated architecture. The multi-threaded engine provides you the industrial secure and real-time environment for your applications. The modular-oriented design simplifies the development for a complex application. The open platform allows you to easily integrate GeniDAQ with other applications and devices to share real-time control data.

2

Tutorial

Overview

In general, the design procedure consists of the following steps. The first step is to outline exactly what you expect to accomplish with GeniDAQ. You can decompose your system into several modules and determine how many tasks you want in your strategy. The second one is to make a sketch detailing the flow of data, timing, and so forth. Then implement the system or task functionality and configure your display view or operator interface with GeniDAQ's *Task Designer* and *Display Designer*. If your system needs some specific functionality, such as special mathematical or calculation function, logic operation, task or display control, or link with other applications, which are not built into GeniDAQ, you can make use of GeniDAQ's BasicScript programming to implement them. The last step is to optimize the overall performance by tuning the task scanning, display update and I/O polling.

The intent of this chapter is to provide some general instructions and guidelines for performing basic Advantech GeniDAQ operations. Throughout this chapter it is assumed that you can understand the fundamentals of GeniDAQ. It is assumed that the Advantech GeniDAQ software has been successfully installed. If the Advantech GeniDAQ software has not been installed, install it now. The installation procedure is provided in Chapter 1: *Introduction*. It is also assumed the Demo board has been installed. If not, install it now. The installation procedure is provided in Chapter 1, *Introduction*.

Contents

- Working with Advantech GeniDAQ
- GeniDAQ Tutorials
- Summary

Working with GeniDAQ

The sections that follow describe how to use some of the basic functions in the GeniDAQ Task Designer, Display Designer, Report Designer, and Script Designer. This chapter does not provide detailed instructions for all GeniDAQ functions. Specific instructions for the various GeniDAQ functions are provided in the following chapters.

Before You Begin

You use a mouse to construct strategies and operator display panels within the *Task* and *Display Designers*. The ability to work with a mouse while developing your process strategies and corresponding displays helps make using GeniDAQ intuitive.

Mouse support has been extended to the Runtime system. This allows operators to use a mouse or other pointing device, such as a trackball, touchscreen, etc., to interface with the process. The following terms are used throughout the manual.

Pointing

Positioning the cursor on an icon block, object, field, etc., on the screen by moving the mouse. The mouse is often referred to as the pointing device since it allows you to indicate graphically where you want to work.

Clicking or Double-Clicking

Positioning the cursor on an icon block, object, field, filename, etc., then pressing and releasing the left mouse button quickly. Double-clicking is to press the left mouse button twice in quick succession. This simultaneously selects and performs a field-associated operation.

Selecting

Pointing to something on the screen and clicking on it. Selecting a Block in the Task Designer or Display Item in the Display Designer causes square selection dots to form around the perimeter of the selected object. The dots remain (object selected) until another operation is performed.

Dragging

Holding the left mouse button down while you move the mouse, then finally releasing the button. As you move the mouse across your desk, the respective item moves across the screen and stops when you release the mouse button.

Planning Your Strategy

Before you begin using GeniDAQ to construct your strategy and corresponding operator display panels you should outline exactly what you expect to accomplish with the strategy. Make a sketch detailing the flow of data, timing, and so forth. This may save you valuable re-work time later in your project.

Starting GeniDAQ

After the GeniDAQ software and the desired I/O Device Drivers have been successfully installed, you are ready to start using GeniDAQ. The first step in using GeniDAQ is to develope a strategy from within GeniDAQ Task Designer.

To begin working with GeniDAQ, you must first boot with Windows 95/98 or Windows NT, enter the Advantech GeniDAQ program group and double-click on the GeniDAQ Builder icon. The GeniDAQ software loads, and you should see a pop-up window to introduce GeniDAQ and its version. After several seconds, the pop-up window disappears and a blank GeniDAQ main window opens.

Figure 2-1: GeniDAQ information

Using On-Line Help

You can get Help while using GeniDAQ by choosing a command from the Task Designer Help menu or by pressing F1. GeniDAQ also includes a Help button in each dialog box, so that you may access context-sensitive help on a specific topic.

To access Help from GeniDAQ:

1. From the Help menu in the Task Designer, choose a Help command.
2. Or press F1 while using GeniDAQ.
3. Or choose the Help button in a dialog box.

A Help window appears. The topic that is displayed depends on which Help command you chose, what was selected when you pressed F1, or which dialog box you were using when you chose the Help button. The Help Contents for GeniDAQ appear when you enter Help using the menu item labeled Index. Within GeniDAQ, a Help topic on the selected command or dialog box appears when you use the Help Button within the current dialog box.

Building Your Strategy

Before you can use GeniDAQ to run a process strategy interactively with its corresponding operator displays in real time, you must first develop a strategy and design the corresponding operator panel(s). GeniDAQ Task Designer and Display Designer are used to accomplish these tasks.

After entering the GeniDAQ program, a new strategy file can be designed (invoked first because the process strategy is the basis of your process control/monitoring). Select New form the File menu bar in the Advantech GeniDAQ Main window. You will see a Task Designer window entitled “Task Designer - TASK1” and a Display Designer window entitled “Display Designer - DISP1” on your screen.

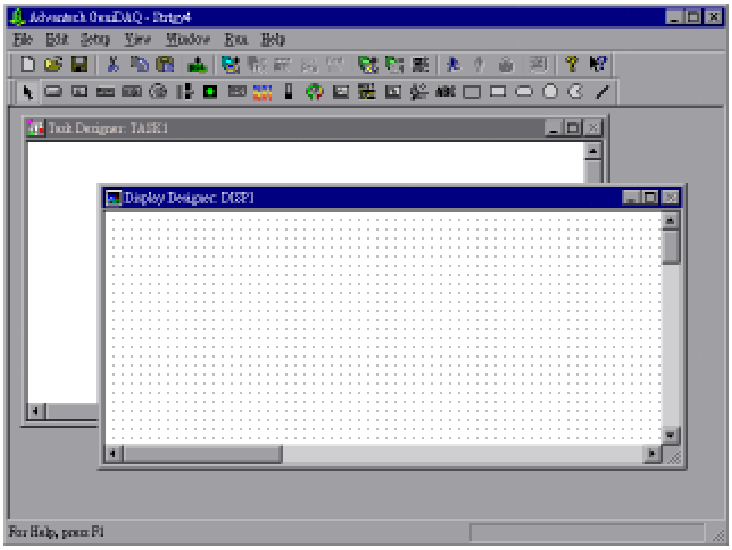


Figure 2-2: New strategy file

You start GeniDAQ by double clicking the GeniDAQ Builder icon in the GeniDAQ program group or executing GENIDAQ.EXE in the command line. A blank window will be displayed within the GeniDAQ main window. This is the beginning of developing a strategy. If you click symbol in the Main window, Task Designer and Display Designer will be activated and appear in the upper part of the Main window. You can activate Script Designer by clicking on File, Add/Delete, Add Main Script option of the Main window.

GeniDAQ Tutorials

In order to help you become familiar with GeniDAQ quickly, we provide nine tutorial programs located in the GeniDAQ\Strategy directory. All example strategies use the Advantech DEMO I/O=1H device that is included with GeniDAQ, allowing you to run the demonstration programs without additional hardware.

The following is a step-by-step tutorial on how to use the demonstration strategies, as well as how to design strategies within GeniDAQ. It is designed with the beginner in mind. If you follow the tutorial, you should not encounter problems. The first demonstration, "TUTOR1.GNI" will be fully explained. Following examples will be more concise and use the understanding gained in the first demonstration as building blocks.

Tutorial 1: One Task with Display

Purpose

The purpose of this tutorial is to demonstrate how to work with GeniDAQ. In this tutorial, we will show you the easy way to use GeniDAQ to acquire data and display it with numeric display and trend graphs in the display window. This tutorial introduces GeniDAQ.

Function

Use Advantech DEMO I/O device AI block to acquire simulated I/O data and show the data by numeric value and trend chart in the display window.

Procedure

1. Invoke GeniDAQ by double clicking on the GeniDAQ Builder icon in the GeniDAQ workgroup. After double clicking, a blank window will be displayed on your screen. Click once on the File menu to pull down the menu, and choose New. After creating a new strategy file, two blank windows will pop up. One is TASK1 of Task Designer and another is DISP1 of Display Designer. The new TASK1 window will appear on the front of your screen and TASK block toolbox will be displayed on the left of TASK1 window. The window should look like Figure 2-3.
2. Choose the AI block from the Task block Toolbox and click on it. AI block will be chosen. Move the mouse to the working area of the TASK1 window and press the left mouse button. An AI block will be added to the working area as AI1. This operation is called Drag and Drop

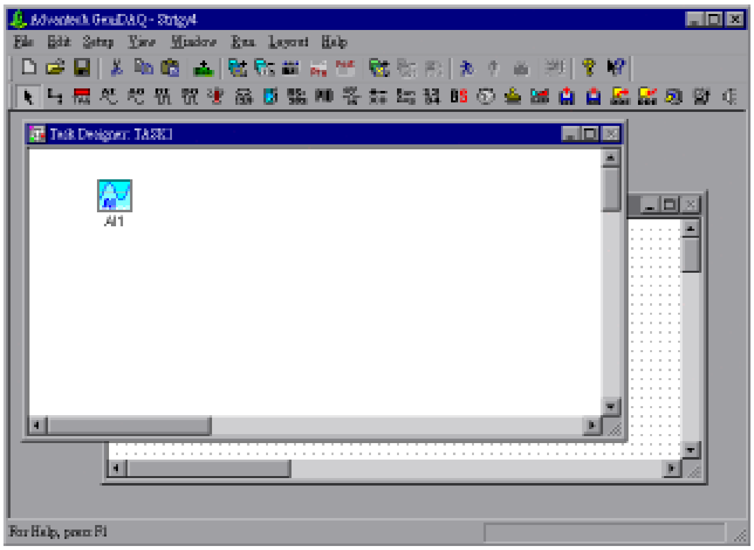


Figure 2-3: Add an AI block

3. Double click on the AI1 block. You will see a dialog box like that shown below:

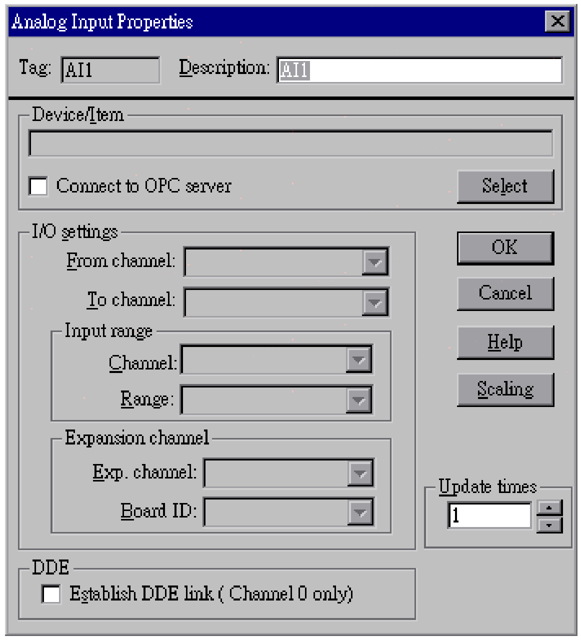


Figure 2-4: Configure AI block I/O device

4. In the AI configuration dialog, if the Device: box is empty, click on the downward pointing arrow at the end of the box and click once on Advantech DEMO I/O:0H. This will configure this analog input block to use the data from the Advantech DEMO I/O device, which has an I/O address of 0H.

   (0 hexadecimal). The channel should be set to 0 to view a sine wave. Now that the AI1 block is configured, click once on the OK button, which will save the configuration of the block and close the dialog box, returning you to the task window.

5. After creating an AI block in Task Designer “TASK1” you can change the activated window to Display Designer “DISP1” by clicking once on the Window menu and pulling the menu down. Select “Display Designer : DISP1” item to activate Display Designer “DISP1”. A Display item Toolbox will be displayed on the left of the Display1 window, like the following:

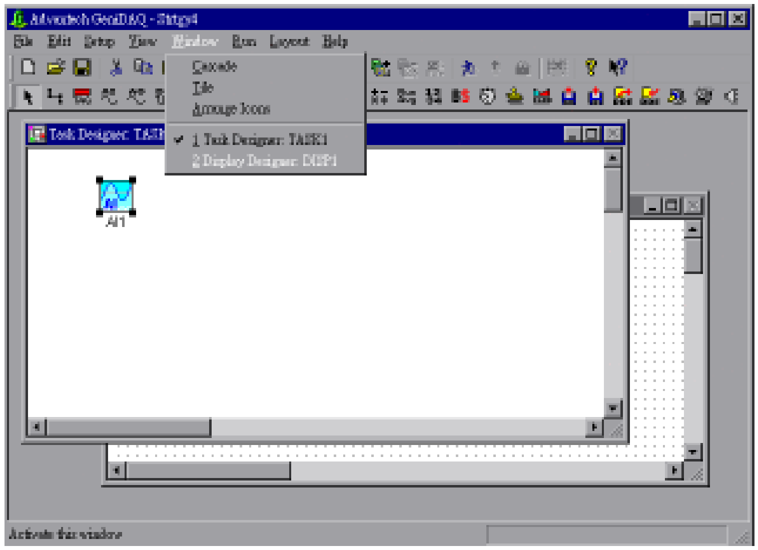


Figure 2-5: Switch Task and Display

6. Choose the numerical display item from the display item toolbox. The numerical display item will be in depressed mode. Move your mouse to the working area of DISP1 window and press the left button of the mouse. A numerical display item is added to the Display1 window, as shown below:

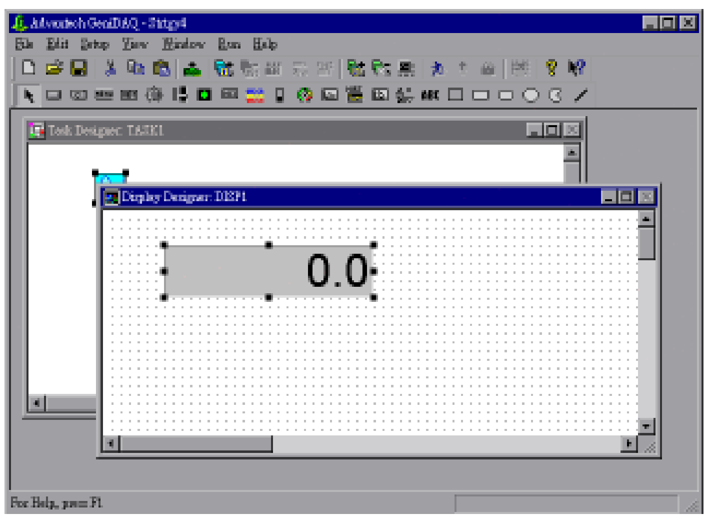


Figure 2-6: Add a numerical display item

7. Double click on the numerical display item. You will see a dialog box appear like the following:

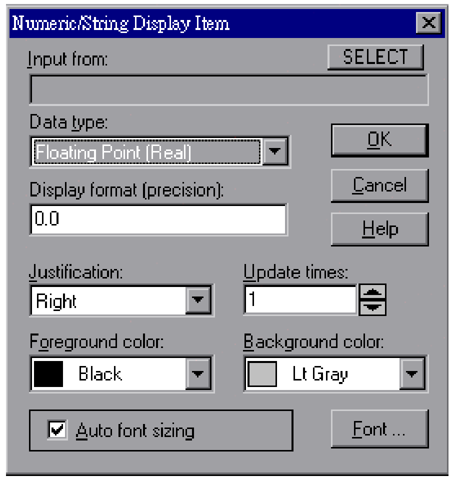


Figure 2-7: Configure a numeric display item

If the Input from box is empty, click on the Select button once. A pop-up dialog panel will appear to configure the data input from, like the following:

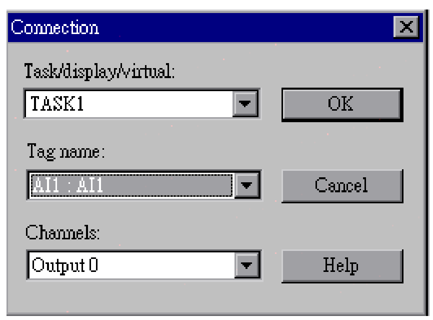


Figure 2-8: Connect Task and Display

In this pop-up dialog window, you have to choose TASK1 from the Task/Display field and choose AI1 from the TAG field. The channel field will display the default channel number: Output 0. You can select another channel number from this field. We use Output 0 in this example.

8. Now that the numerical display block is configured, click once on the OK button at the dialog window to save the configuration.
9. Do the same way as step 6 to add a Trend graph display item at the Display1 window and configure it to link with the same task block (AI1) and the same channel.

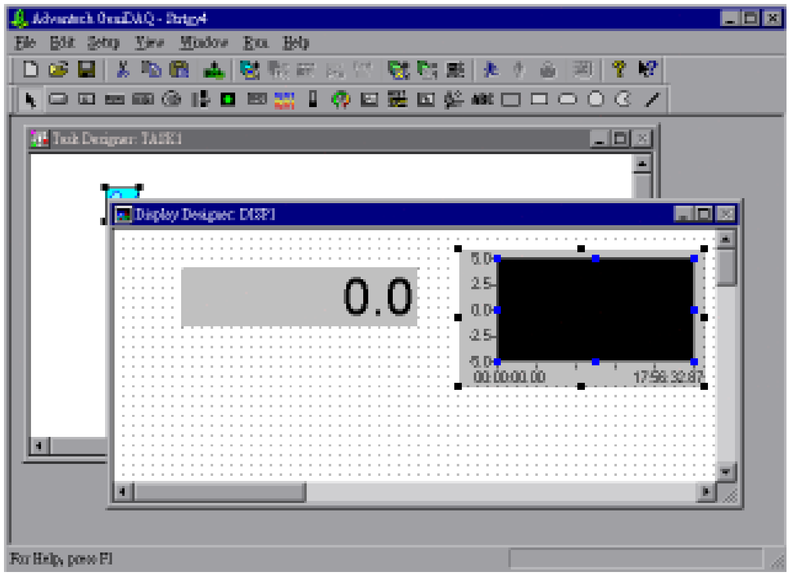


Figure 2-9: Add a trend graph item

10. Click once on the File menu and choose the Save option from the submenu. A window will pop up to save your strategy file. The saving operation is the same as any other Windows file saving operation. Enter the filename tutor1.gni, choose the desired directory, and press the OK button. The strategy file will be saved to disk.

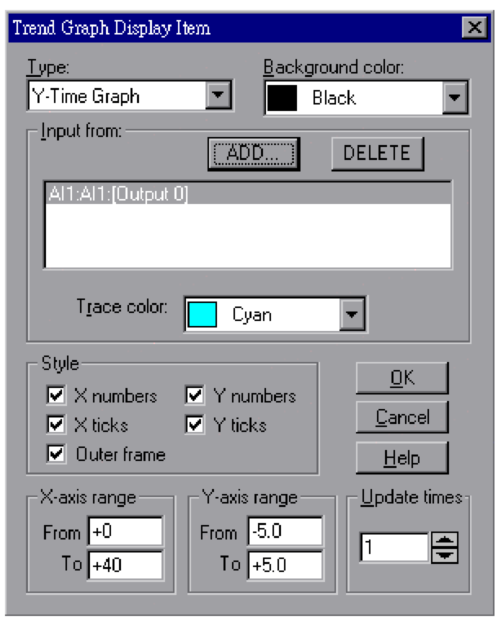


Figure 2-10: Configure a trend graph item

Figure 2-11: Save a strategy file

After saving your strategy file, you can run this strategy file immediately. Click on the Run menu and choose the Task option on the drop down menu. The strategy file will be executed and Numeric Display item and Trend Graph Display Item will immediately show the current value in the Display window, like the following:

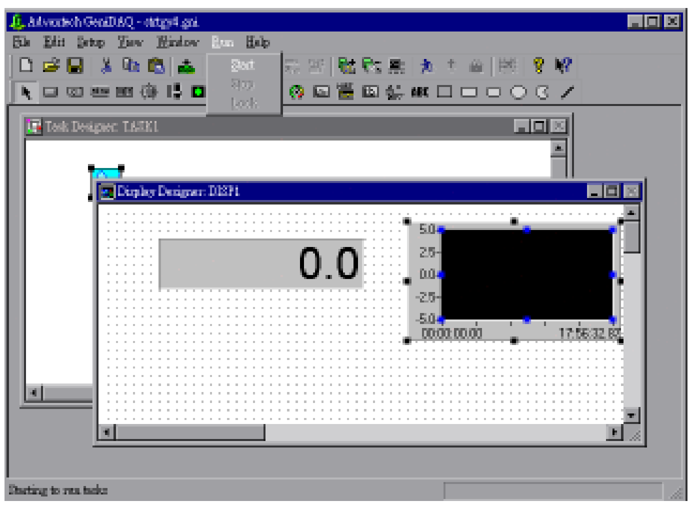


Figure 2-12: Start to run strategy file

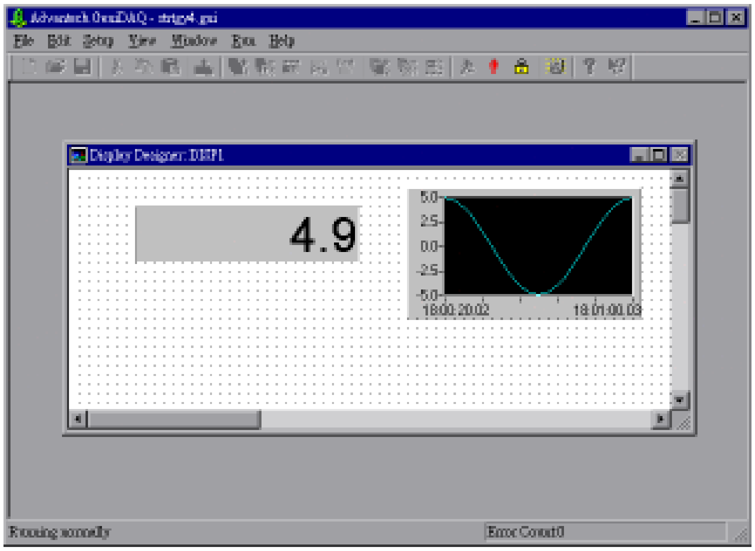


Figure 2-13: Strategy file execution results

Tutorial 2: Multiple Displays and switching

Purpose

The purpose of this tutorial is to teach you how to design multiple display windows in GeniDAQ and switch the display window while running.

Function

Use Advantech DEMO I/O device AI block to acquire simulated I/O data and show the data by numeric value and trend chart in different display windows. Add a menu button on each display window for switching between windows.

Procedure

1. Refer to Tutorial 1 Step 1.
2. Refer to Tutorial 1 Step 2 to Step 8 to create an AI block at Task1, a Numeric Display item at DISP1 and a trend graph display item at DISP2.
3. Click once on the File menu and choose Add Display from the Add/Delete submenu. "DISP2" display window will be added at the front of the screen. Create a trend graph display item at DISP2.
4. Choose the Menu Button Control item from display item toolbox at DISP1. Drag the item to DISP1 working area and click the left mouse button to drop it in DISP1.

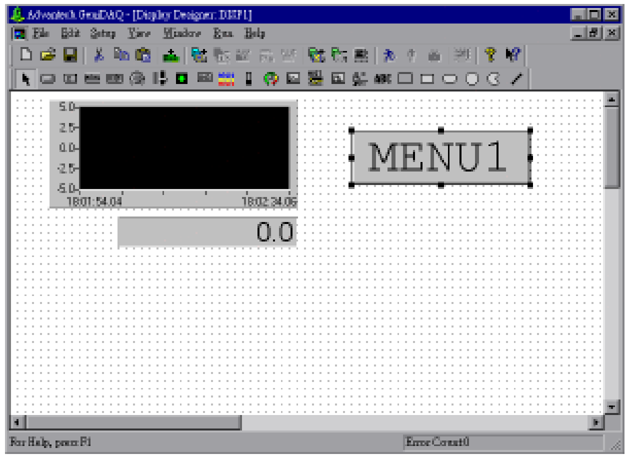


Figure 2-14: Add a display window

Follow the same procedures to add a Menu button control item to DISP2.

5. Double click on the menu button control item MENU1 at DISP1. A dialog box will appear to configure the Menu button. Set the function field in the dialog to be Display Switching and select the Display Switch field of the dialog to be DISP2. Save the configuration by clicking on the OK button.

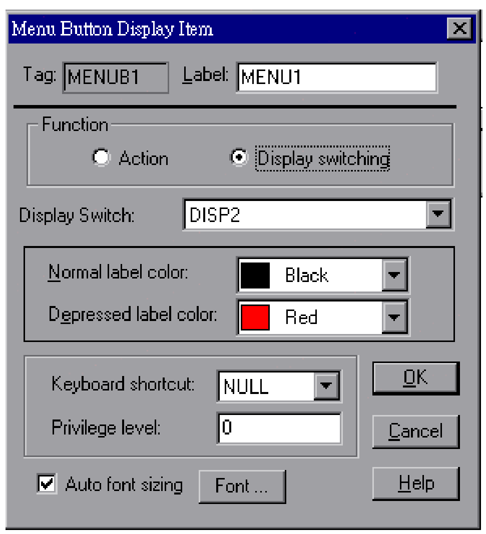


Figure 2-15: Configure display switch to DISP2

6. Follow the same procedures for DISP2, but change the Display Switch field of the dialog window to be DISP1.

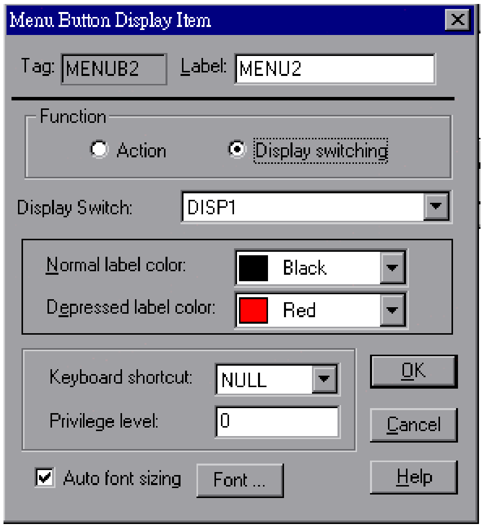


Figure 2-16: Configure display switch to DISP1

7. Save the strategy file as "TUTOR2.GNI"
8. Run the strategy file by selecting Task from the Run menu. The screen will first show DISP1 on the screen. DISP1 shows a numerical item value that is updated dynamically. Press the menu button on the DISP1 window and the display window will be changed to be DISP2 window. You will see a trend graph chart drawing a sine wave. Press the menu button on the DISP2 window, and the screen will return to the DISP1 window.

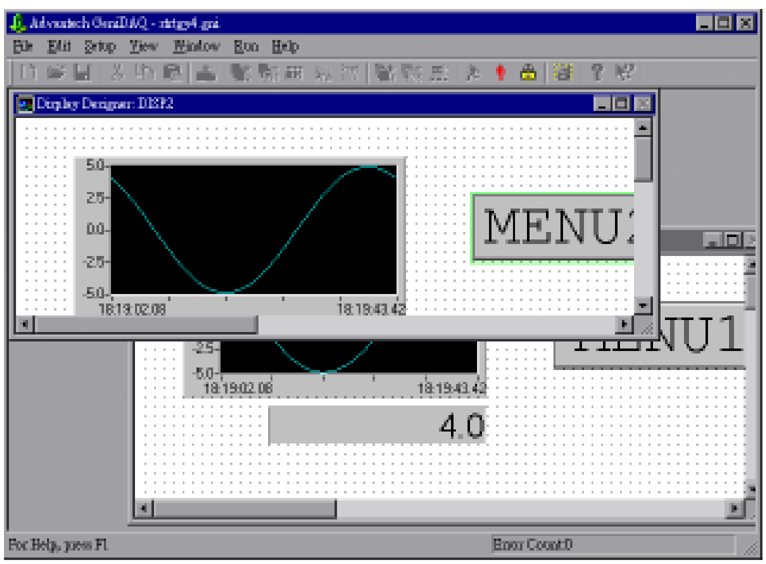


Figure 2-17: Change between screens

Tutorial 3: Execution Order Arrangement

Purpose
The purpose of this tutorial is to teach you how to design multiple tasks in a strategy file and how to arrange the execution order of task blocks.

Function
Create two AI block and one single operator block in a task and execute a symbol, addsymbol operation in single operator to add two AI blocks and show their result. Repeat the above operations with another task and show the result on the same display. Rearrange the execution order to see the impact.

Procedure
1. Refer to Tutorial 1 to start GeniDAQ and add a new Task.
2. Add two AI blocks and a single operator calculation block Add into Task1. Configure AI1 block to be the input from Advantech DEMO I/O channel 0 and AI2 block to be the input from the same device and channel.

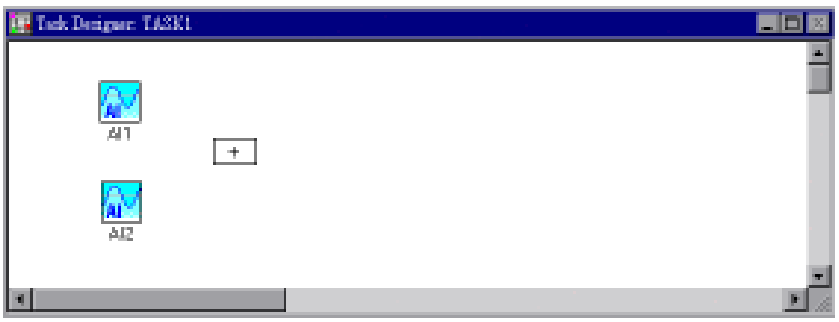


Figure 2-18: Add two AI blocks and a single operator block

3. Click on the Wire block in the task block toolbox. The mouse will change to a wiring icon. Click once on the AI1 block to be the source of a link connection and move the mouse to the single operator block and click once again. A wire connection will be established between AI1 and the single operator block. A pop-up panel will be displayed to choose the output channel number of AI1. Select the channel 0 to be the output channel, refer to Fig 2-20. Another pop-up panel will be displayed to choose the operand of operator Add. Select the operand 1. Refer to Fig 2-21.

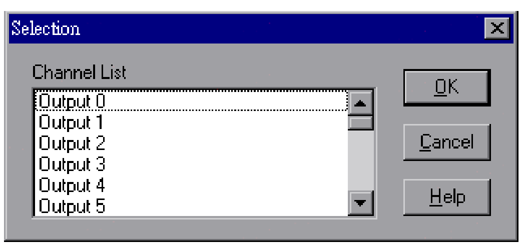


Figure 2-19: Select output channel of AI block

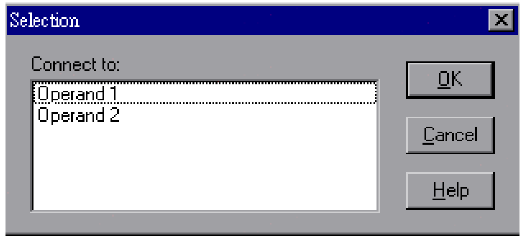


Figure 2-20: Select the operand of single operator

Do the same thing as above for AI2 block to link with single operator block. Select channel 0 and operand 2 as the output channel and the operand of operator Add.

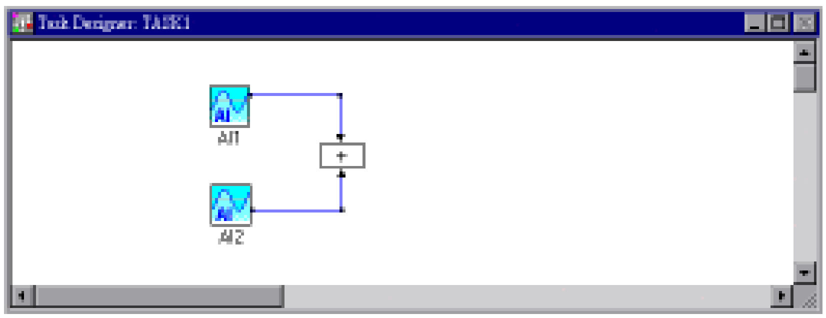


Figure 2-21: Wire two AI blocks to a single operand block

4. Repeat Step 2 and Step 3 to add a single operator calculation block Subtract.

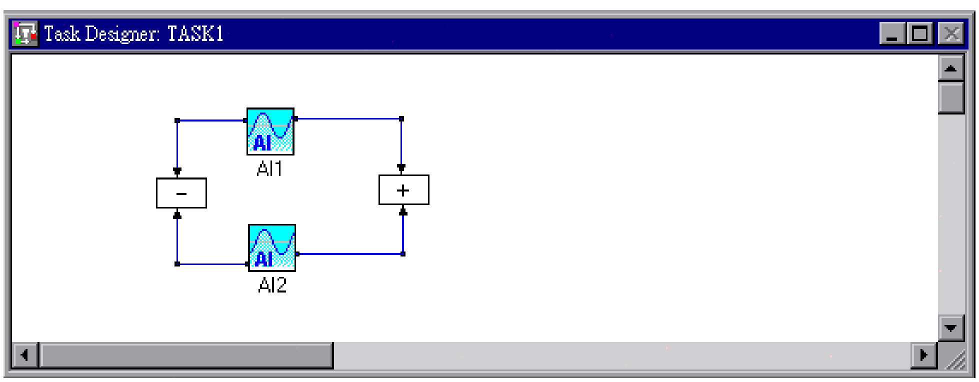


Figure 2-22: Wire two AI blocks to two single operands

5. Click on the View menu and activate Order Layout option to show the execution order number at the upper half of each block.

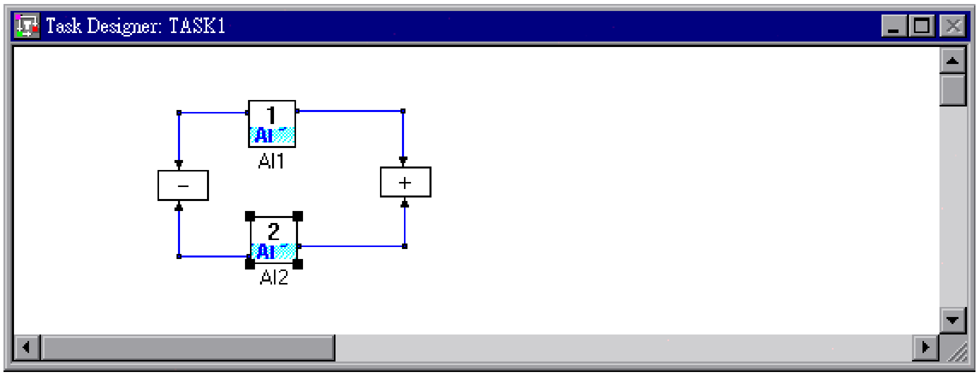


Figure 2-23: View the execution order

6. To arrange the execution order, click on the Layout menu. From the Layout submenu select the Complete reorder menu option. You can change the order of task blocks immediately. Move the mouse to the AI1 block and click once, the order number of AI1 will be 1. Move the mouse to the AI2 and click once, the order number of AI2 will be 2. Move the mouse to single operator calculation block Add and click once. The single operator block will show order number 3 at the upper half of icon. The single operator calculation block Subtract will be set as number 4.

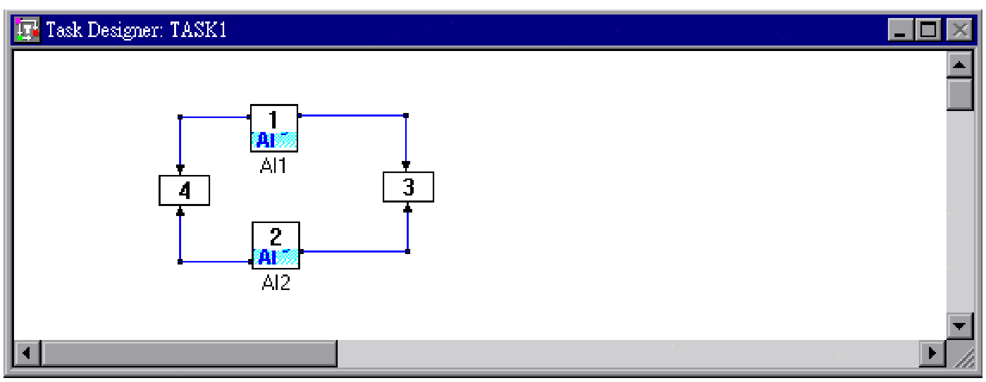


Figure 2-24: Arrange the execution order

7. If you want to exchange the order between single operator calculation block Subtract and single operator calculation block Add, you have to click on the Layout menu and activate the Exchange order option. After activating Exchange order function, move the mouse to the desired two blocks and click on them. The order numbers will be changed automatically.

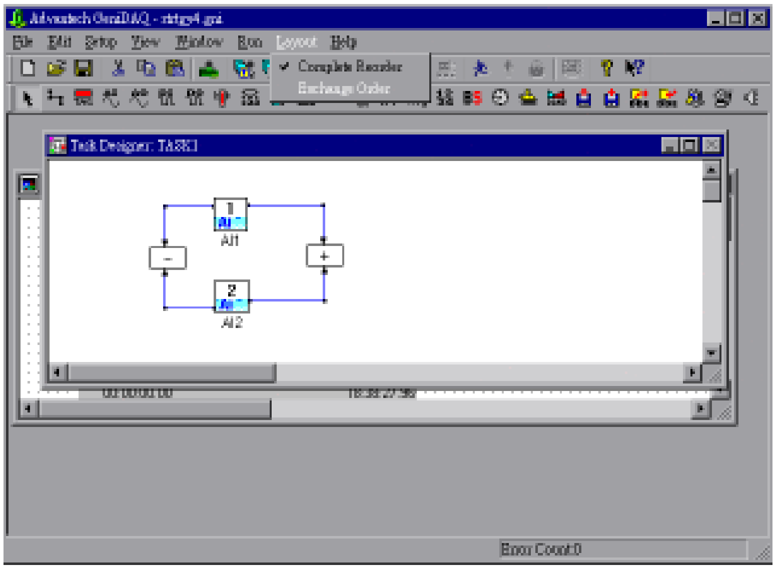


Figure 2-25: Exchange execution order

8. Refer to Tutorial 1 Step 9 to save the strategy file as “TUTOR3.GNI”
9. Run the strategy file to see the impact of different ordering.

Tutorial 4: Drawing tool in Display Designer

Purpose

The purpose of this tutorial is to teach you how to use the drawing tools in display item toolbox to customize you display.

Function

Use oval and rectangle drawing blocks to draw a pump and combine them into a pump object using the Make Object option of the Edit menu. After that, link a binary control display item to the combined object and use the control item to assign different values to the pump object and change its color.

Procedure

1. Refer Tutorial 1 to start GeniDAQ and add new Tasks.
2. Add a binary button control item at the Display1. Configure this control button to be an ON/OFF control and output a 0 or 1 data value.

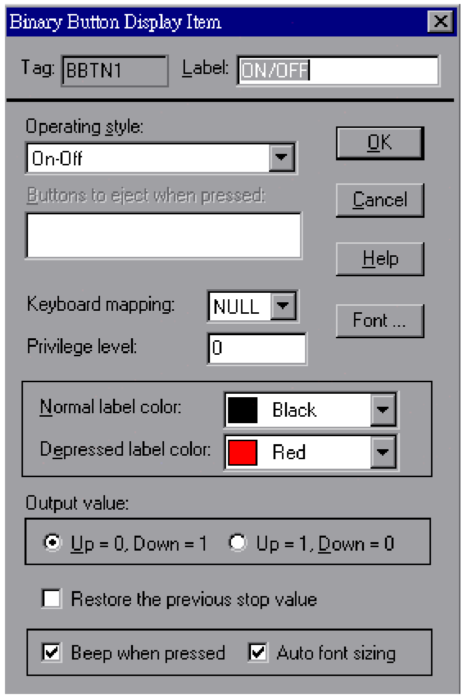


Figure 2-26: Add a binary button control item

3. Click once on the oval drawing item in the display item toolbox. Drag the oval drawing item to the display working area. Choose the added oval item and press “Ctrl+C” to copy it. Press “Ctrl+V” to paste it to the same display working area. Select one oval drawing item and move your mouse to one corner of the rectangle and enlarge the drawing item.

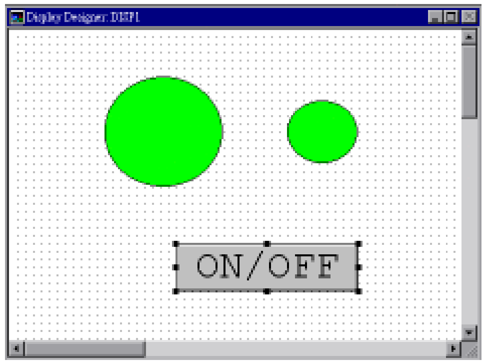


Figure 2-27: Add a binary button control item

4. Add two rectangle drawing items on the same display working area by drag and drop or copy and paste operations.

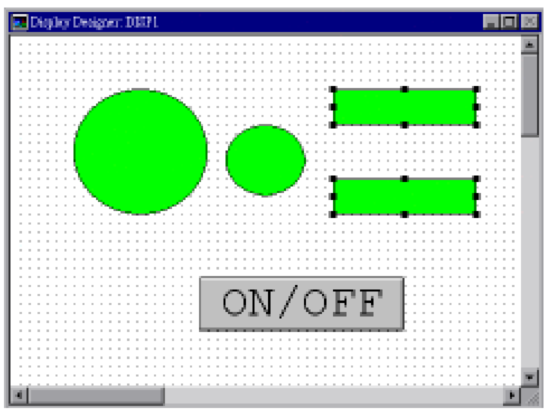


Figure 2-28: Add two rectangle drawing items

5. Configure the drawing items by double clicking on each one. A pop-up dialog will be displayed for configuring the input.

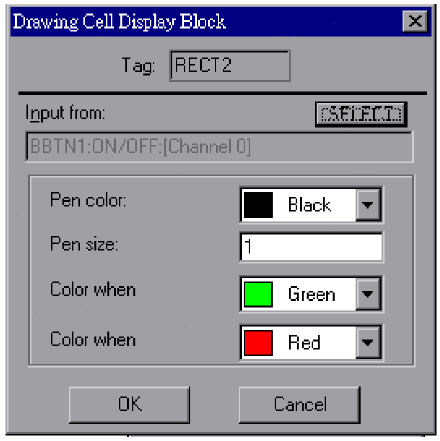


Figure 2-29: Configure Drawing item

Select Display1 from Task/Display field and BBTN1:ON/OFF from TAG field in configuration dialog. Set the color to be red while the input is equal to 1 and Set the color to be green while the input is equal to 0. Press OK to save the configuration.

6. Arrange these drawing items to be a pump picture, like the following. You can send the rectangle objects to the back of oval objects by clicking on the Edit menu and Send to Back option. After that, select all the parts you wants to build into an object, and click on the Edit menu and Make Object menu option in Display Designer to combine these four drawing items into one drawing item, like the following.

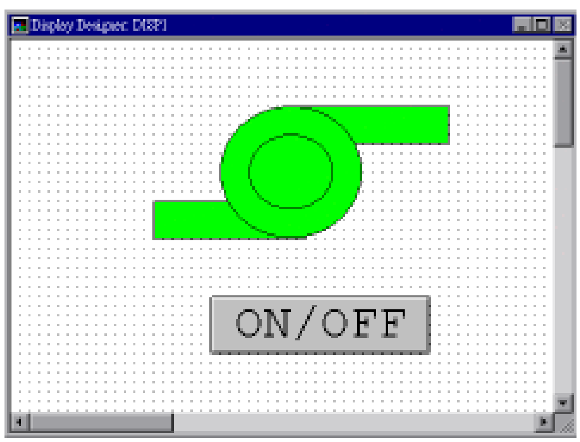


Figure 2-30: Make object

7. Save the strategy file to be "TUTOR4.GNI"
8. Run the strategy file. You will see the color of pump picture will be red while you press the binary control item. The color will be green while you press the binary control item again.

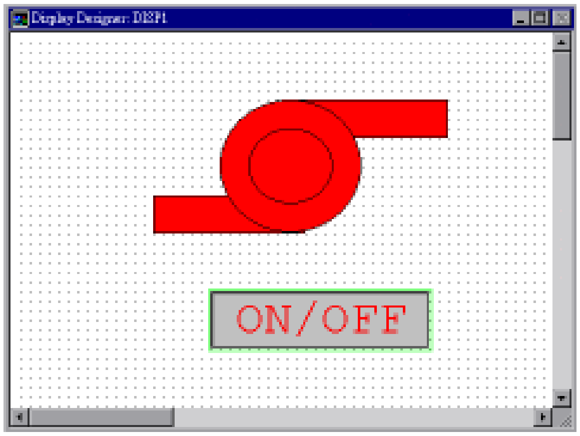


Figure 2-31: Run strategy file "TUTOR4.GNI"

9. If you want to modify the integrated drawing item, select the Break Object option from the Edit menu in Display Designer.

Tutorial 5: TAG block for integrating Task with Display

Purpose

The purpose of this tutorial is to teach you how to use TAG block in Task Designer to retrieve user input data in Display and process it in Task.

Function

Creates a numeric control item to input a control value in a display. Design TAG block to retrieve user input value and Alarm block to check if the input value is out of alarm range. If it is out of range, then a red lamp is displayed, otherwise a green lamp is displayed.

Procedure

1. Refer to Tutorial 1 to start GeniDAQ and add new Tasks and Displays.
2. Design a numeric control display item and a indicator display item in the Display1 window. Configure the numeric control display input type to be a floating number and configure the indicator display to be a round lamp shape. Set the color to be red while the input is equal to 1 and green while input is equal to 0.

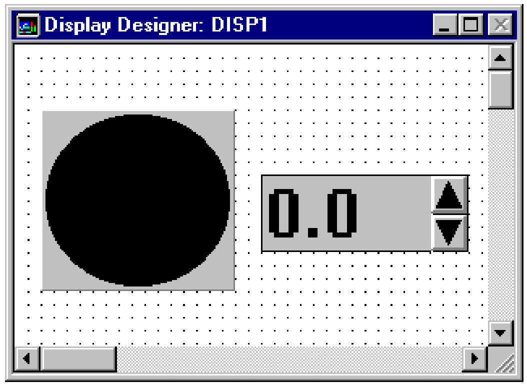


Figure 2-32: Add numeric control and indicator display item

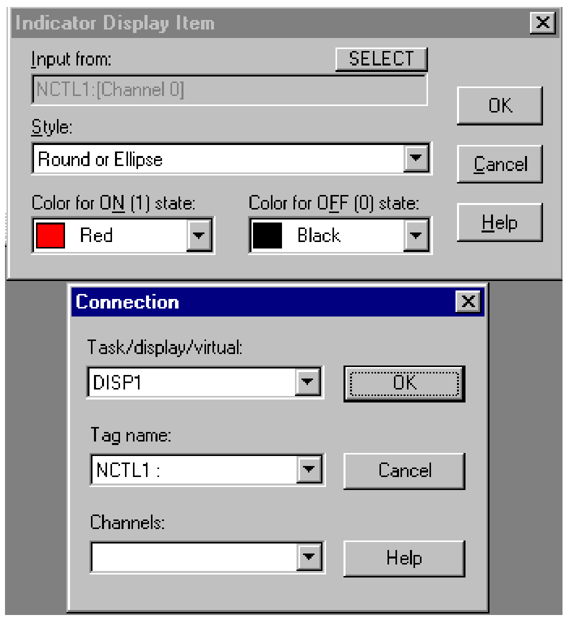


Figure 2-33: Configure indicator display and link to Task

3. Design an Alarm block and a TAG block in Task1.

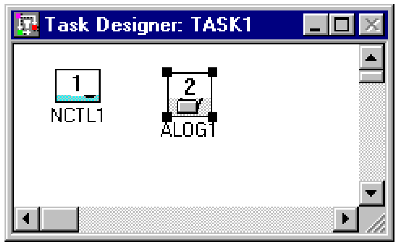


Figure 2-34: Add alarm block and TAG block

Double click Alarm block to configure the value of hi-hi field to be 90, the value of Hi field to be 80, the value of lo field to be 20 and the value of lo-lo field to be 10.

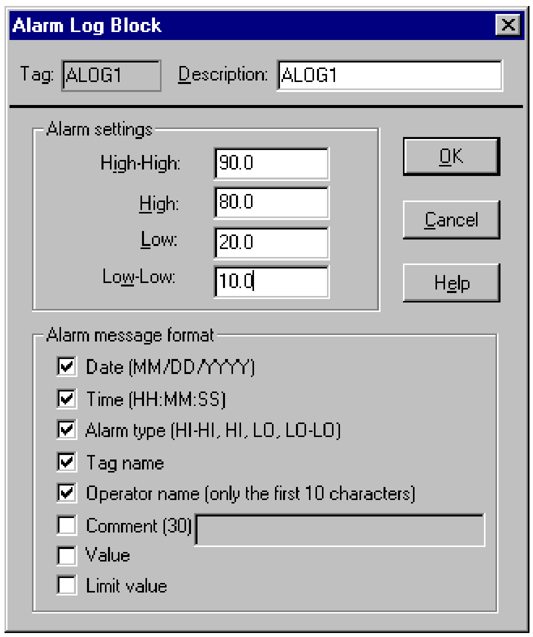


Figure 2-35: Configure alarm block

Double click TAG block to configure TAG as a linkage to the numeric control item of Display1 by setting the Task/Display field to be Display1, the TAG field to be CTRL1 in configuration dialog.

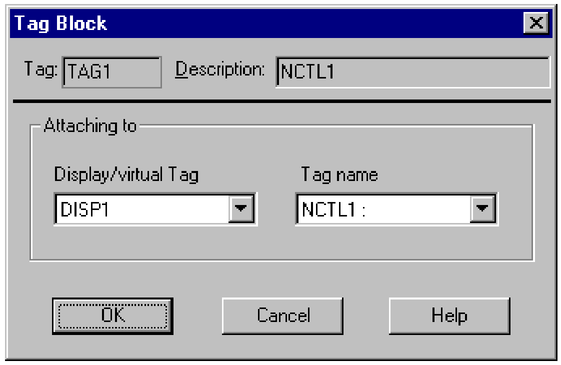


Figure 2-36: Configure TAG to link with display item

4. Connect the TAG block to Alarm block in Task1 by wire link. Take TAG value as the input value for alarm block and compare the value with hi-hi, hi, lo, and lo-lo field of alarm block. If the TAG value is exceeded or beyond the set values of the alarm block, an alarm value will be output to the button display.

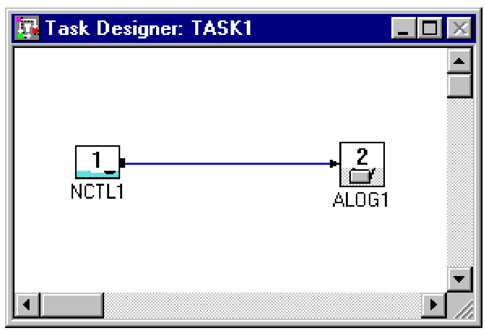


Figure 2-37: Connect TAG block to alarm block

5. Double click indicator display item in DISP1 to configure it and link to the output value of alarm block in Task1. You are advised to add two label display items in DISP1 for showing hi and lo alarm values. In this example, the label display items are “Upper Limit=80” and “Lower Limit=20”

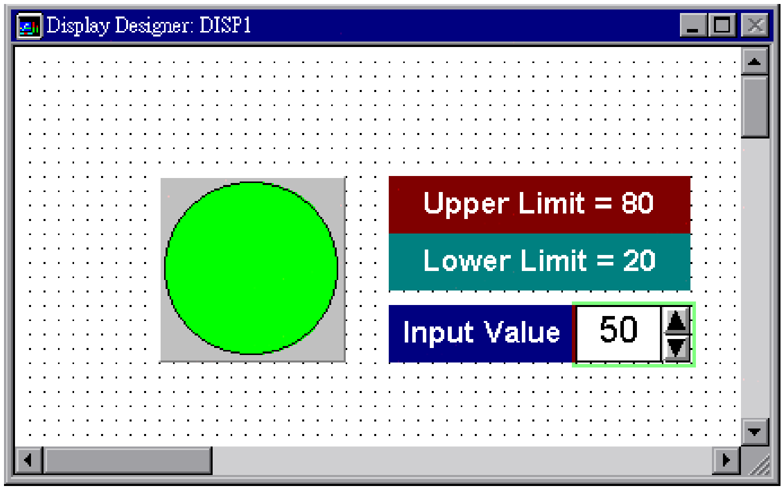


Figure 2-38: Run strategy file “TUTOR5.GNI”

6. Refer to Tutorial 1 Step 9 to save the strategy file as “TUTOR5.GNI”
7. Run the strategy file and type a value in the numeric control item. If you type 50 in the field, you will find the indicator display is green. However, if you type 81 or 19, the indicator display will be red.

Tutorial 6: BasicScript block

Purpose

The purpose of this tutorial is to give you a guide on how to program the BasicScript block.

Function

1. Get Advantech DEMO I/O AI channel 0 value
2. Compare the AI channel 0 value with the value the user typed in.
3. If AI value is greater than input value, then turn on the alarm lamp to be red, otherwise turn it off to be green.

Procedure

1. Refer Tutorial 1 to start GeniDAQ and add new Tasks.
2. Add a numeric display item, a numeric control display item, a indicator display item and two text display items into Display1 window.

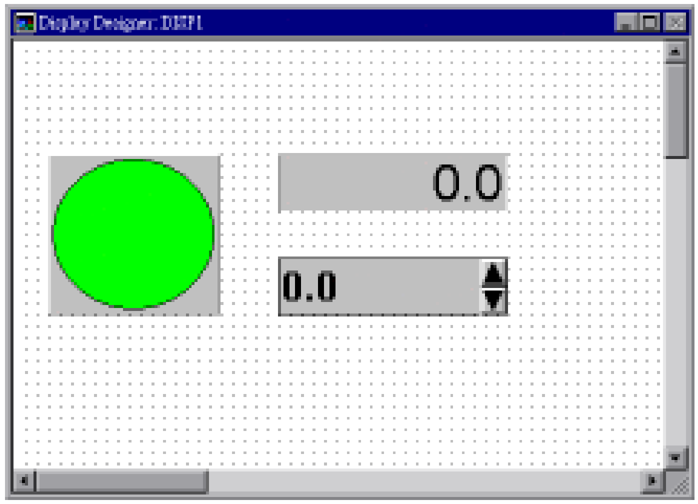


Figure 2-39: Build display screen

3. Add AI block, BasicScript block and TAG block in Task1. Configure AI block to be Advantech DEMO I/O channel 0. Connect AI1 block to BasicScript block and NCTL1 block to BasicScript block by wire link.

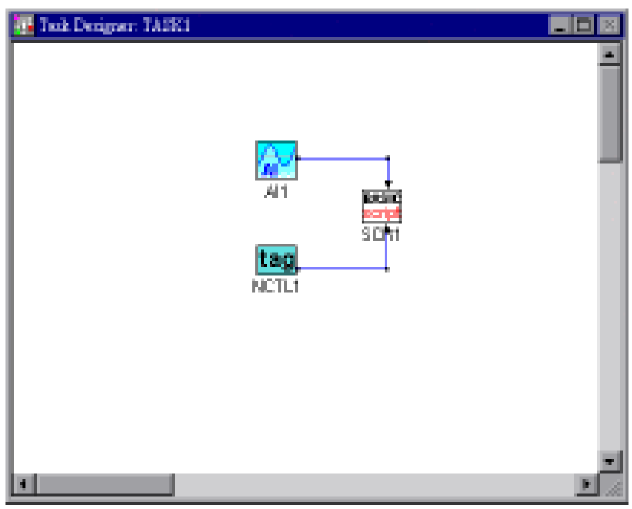


Figure 2-40: Build Task icon and wiring

Link TAG1 with numeric control item in Display1 window.

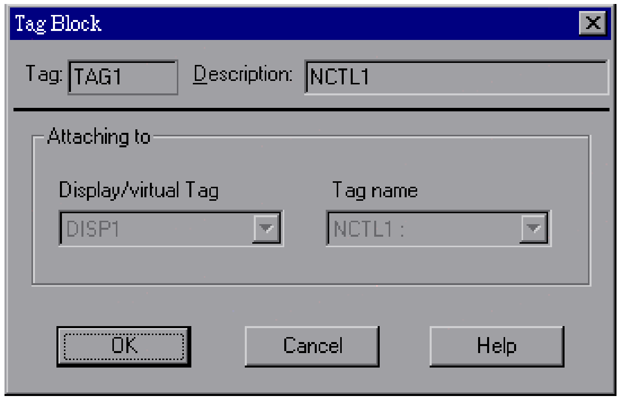


Figure 2-41: Link TAG to numeric control item

4. Double click the BasicScript block to edit a Basic script program. Key in the following text program in the pop-up window:

```
Sub SCR1()
 dim mytag1 as TAG
 dim mytag2 as TAG
 set mytag1 = GetTag("Task1", "AI1")
 set mytag2 = GetTag("Disp1", "NCTL1")

 if mytag1 > mytag2 then
    outputi 1
 else
    outputi 0
 end if
End Sub
```

5. Double click on the numeric display item in Display1 and configure it to display the value of AI1 in Task1. Double click on the indicator display item in display1 and configure it to display the value of scr1 in Task1.

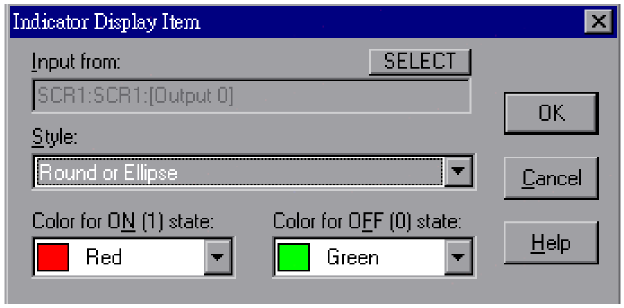


Figure 2-42: Link BasicScript output to indicator display

6. Refer to Tutorial 1 Step 9 to save the strategy file as "TUTOR6.GNI"
7. Run the strategy file. If you type 0 in the numeric control display item, the indicator display item will be red if the AI1 current value is positive, otherwise the indicator display item will be green.

Tutorial 7: BasicScript block with Virtual TAG block

Purpose

The purpose of this tutorial is to guide you on how to use BasicScript block and Virtual TAG block to calculate or analyse I/O data.

Function

Add three blocks in Task1 window. The first one is an AI block in Task1 that inputs values from Advantech DEMO I/O channel 0. The second one is a virtual TAG block that stores the max. value of AI block. The last is a BasicScript block that calculates the max value of AI block and stores it into virtual block. After that, use five items in display designer to show the current AI value, label the max AI value, and add a lamp for max. value changed.

Procedure

1. Refer to Tutorial 1 to start GeniDAQ and create a new task and display.
2. Create a virtual TAG in system by clicking on the SETUP menu and choose the Add/Delete Virtual Tags option, as follows:

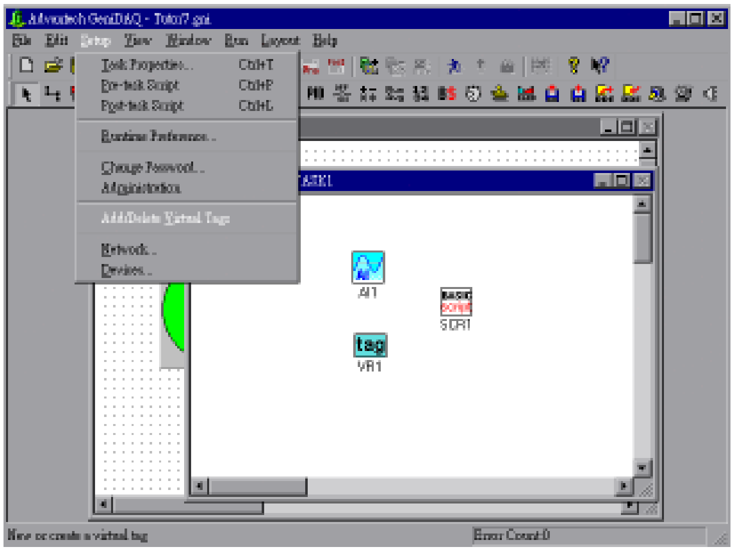


Figure 2-43: Add Virtual TAG

A pop-up window will be displayed to add or delete virtual tags. Choose VR1 at input field and press ADD button to add the virtual tag "R1". Pressing OK will exit this pop-up window and return you to Task Designer.

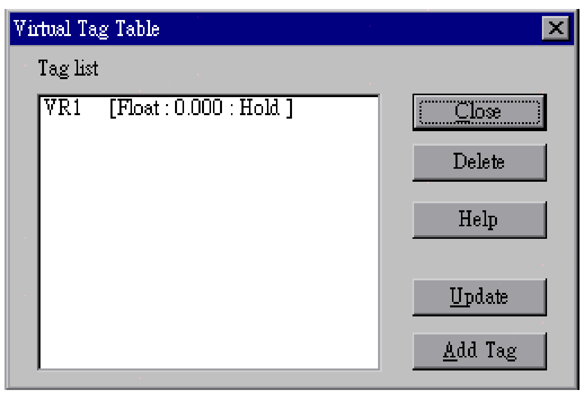


Figure 2-44: Create a new Virtual TAG

3. Add an AI block, a BasicScript block and a TAG block in Task1.

Figure 2-45: Build Task icons

Double click on the AI1 block to configure the input value from Advantech DEMO I/O channel 0. Double click on TAG block to link with Virtual Tag.

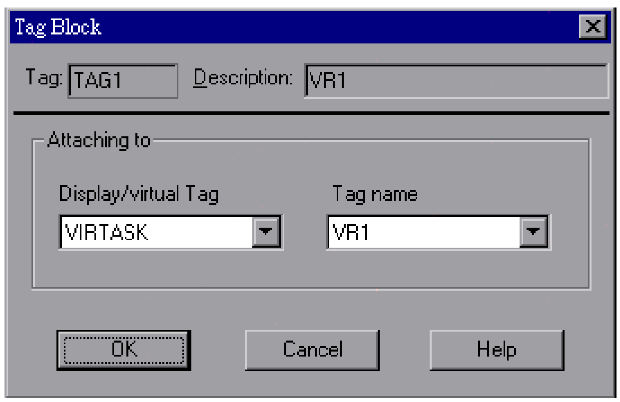


Figure 2-46: Link Tag block to Virtual TAG

Select VIRTASK in the Display/Virtual Tag field and VR1 in tag name field of the above window.

4. Double click BasicScript block to edit Basic script program. Key in the following text program in the pop-up window:

```
Sub SCR1()

 dim mytag1 as TAG
 dim mytag2 as TAG

 set mytag1 = GetTag("TASK1", "AI1")
 set mytag2 = GetTag("VIRTASK", "VR1")

 if (mytag1.value > mytag2.value) then
    mytag2.value = mytag1.value
    outputi 1
 else
    outputi 0
 end if
End Sub
```

5. Add 2 numeric display items, 2 labels and 1 indicator display item in the Display1 window. The 2 numeric display items will be configured to link and display the AI1 value and the virtual tag value in Task1. "Max Value" reflects the virtual tag value and "Current Value" reflects the AI1 value.

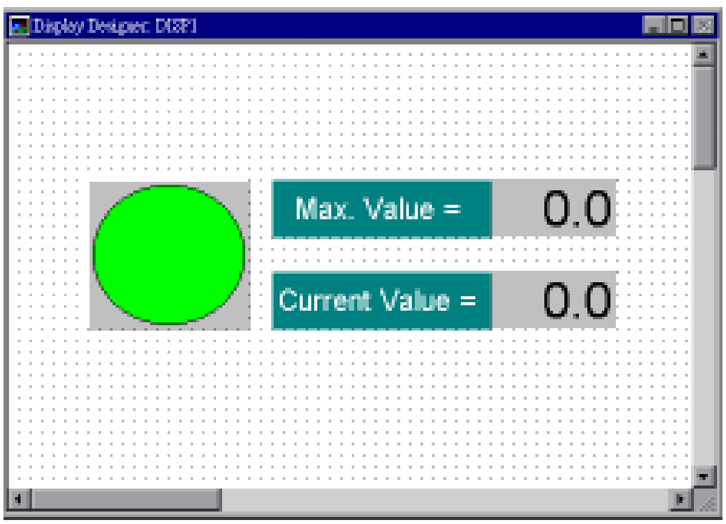


Figure 2-47: Build display screen

Configure the indicator display item to link with the output 0 of BasicScript block.

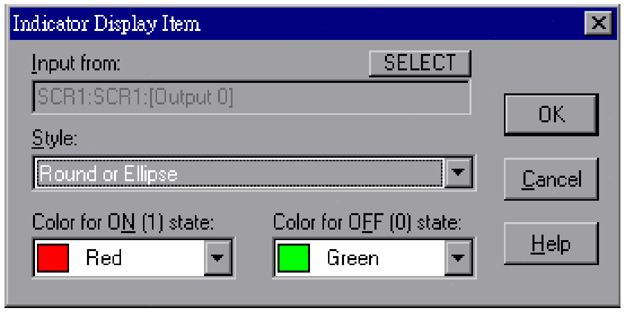


Figure 2-48: Link BasicScript output to indicator display

6. Refer Tutorial 1 Step 9 to save the strategy file as "TUTOR7.GNI"
7. Run the strategy file. At the display window, you will see the AI current value and its max. value. If the AI1 current value is greater that its max. value, the indicator display item will be red. Otherwise, the indicator display item will be green.

Tutorial 8: Main Script programming

Purpose

The purpose of this tutorial is to give you a guide on how to design a Main Script program and use it to control tasks.

Function

1. Create a main script and a task
2. Use main script to start the task and run the task 100 times in main script.

Procedure

1. Refer to Tutorial 1 to start GeniDAQ and add new Tasks.
2. Repeat Tutorial 1 steps to show Advantech DEMO I/O channel 0 value using a Trend graph.
3. Change the properties of Task1 to be controlled by main script. Click on the Setup menu and Task properties... option to invoke the task properties pop-up window.

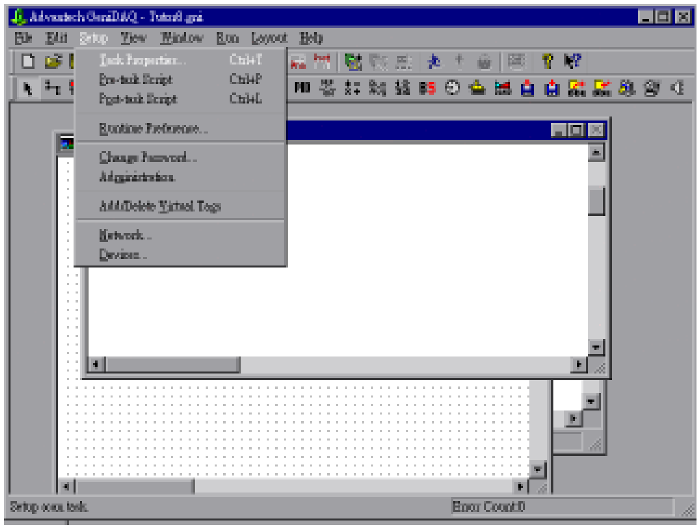


Figure 2-49: Setup Task properties

In the task properties window, change the starting method field to be inactive (activated by command).

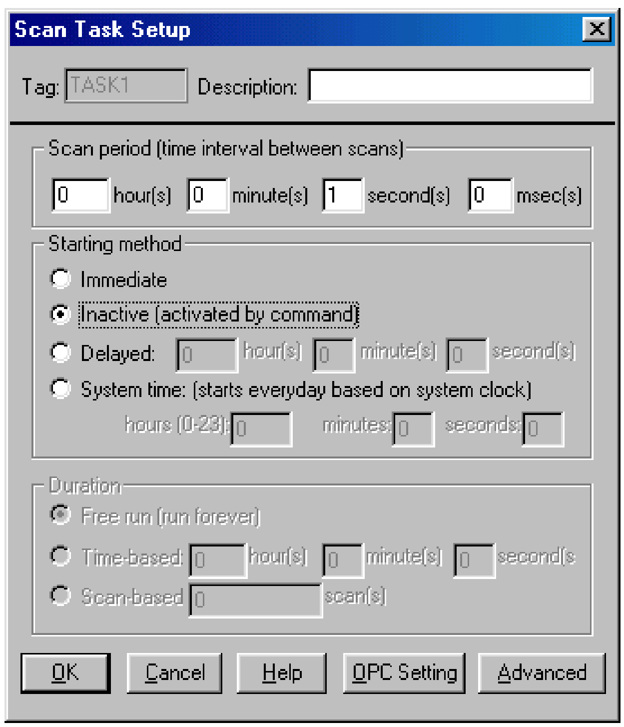


Figure 2-50: Setup ScanTask properties

4. Click on the File menu and choose the Add/Delete, Add Main Script option to invoke Script Designer for editing the Main Script program.

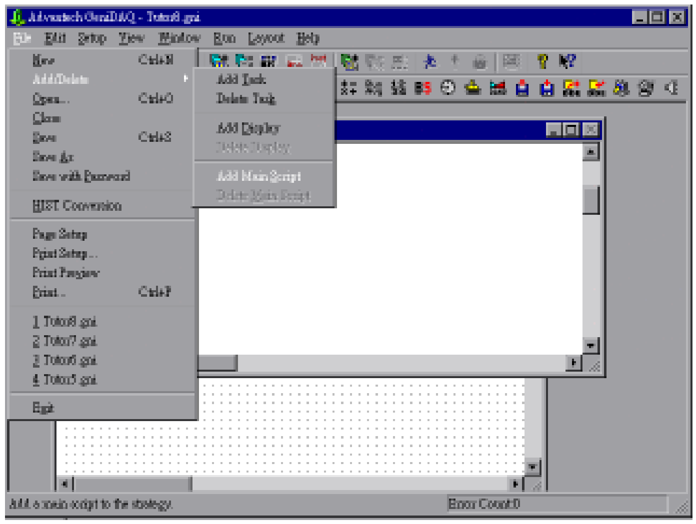


Figure 2-51: Add a main script to the strategy

5. Edit the following program text in the Script Designer window:

```
Sub Main()
 dim mytask as ScanTask
 set mytask = GetScanTask(“Task1”)
 mytask.start
End Sub
```

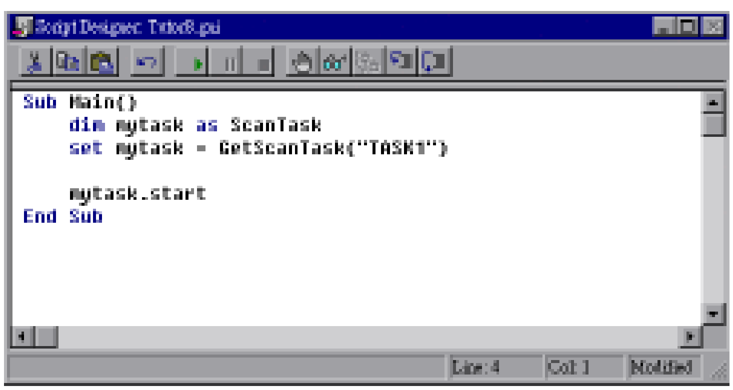


Figure 2-52: Edit main script program

6. Refer to Tutorial 1 Step 9 to save the strategy file as “TUTOR8.GNI”
7. Run the main script program by clicking on the Run menu and Main Script menu options in Task Designer.

Tutorial 9: Controlling multiple tasks

Purpose

The purpose of this tutorial is to give you a guide on how to control multiple tasks in your data acquisition and control system through task properties.

Function

1. Create two tasks within an AI block individually
2. Create a display window and add two trend graphs and labels to show the value of AI blocks in two different tasks.
3. Configure task properties to different working modes.

Procedure

1. Refer to Tutorial 1 for instructions on starting GeniDAQ and creating a new strategy.
2. From the File menu select the Add/Delete, Add Task option to add Task2 window.

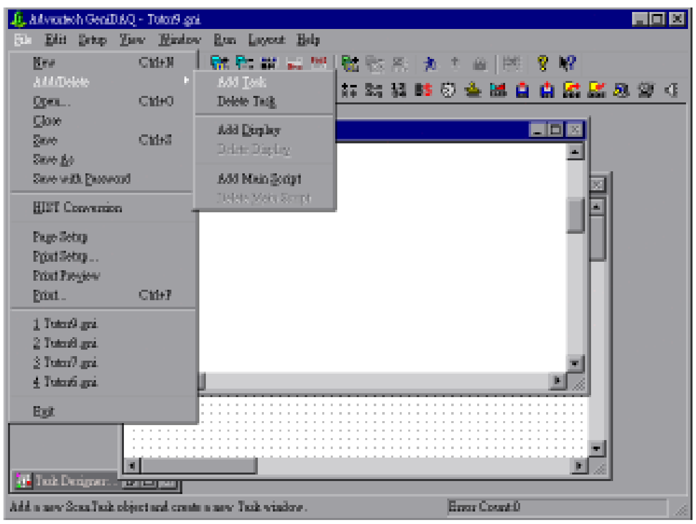


Figure 2-53: Create a new Task

3. Add AI blocks into Task1 and Task2 windows. Configure the AI1 block in Task2 to display the value of Advantech DEMO I/O channel 0 and AI2 block in Task1 to display the value of Advantech DEMO I/O channel 1.

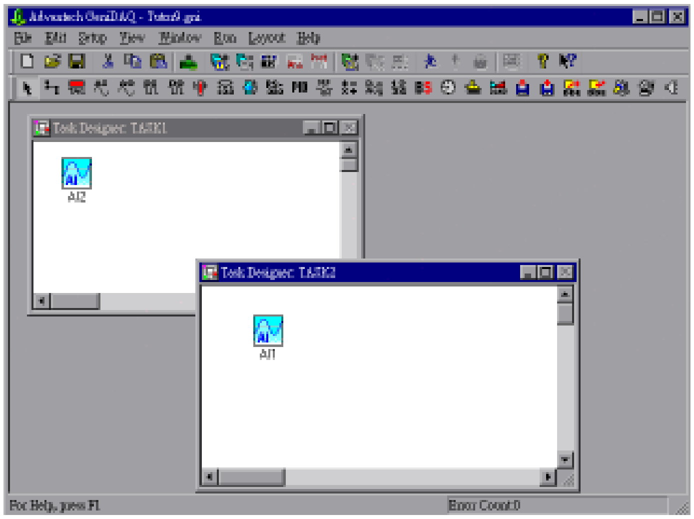


Figure 2-54: Build multiple Task icons

4. Add two trend graphs and two labels in the DISP1 window. Configure the two graphs to show the values of AI1 and AI2.

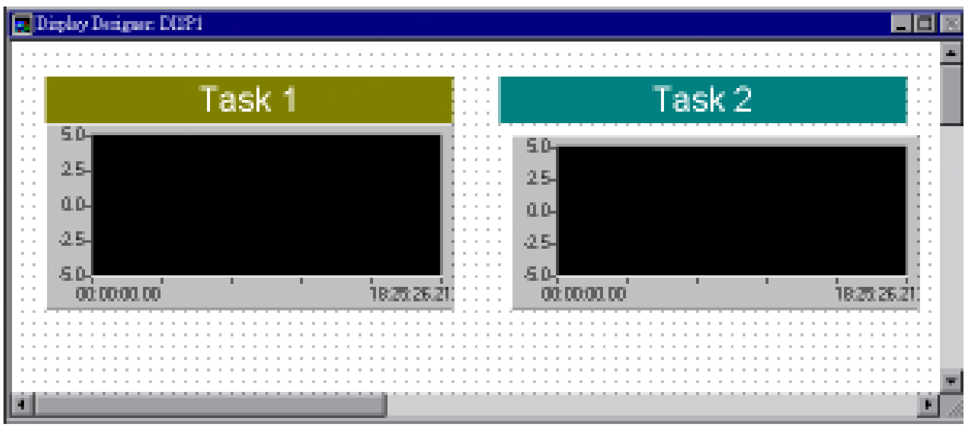


Figure 2-55: Configure trend graphs

5. Configure task properties by activating the task window and clicking on Setup menu and Task properties... options. The duration of Task1 is set to be Indefinitely and the starting method is set to be Immediate. The duration of Task2 is set be 100 times and the starting method is set to be Delayed 5 seconds.

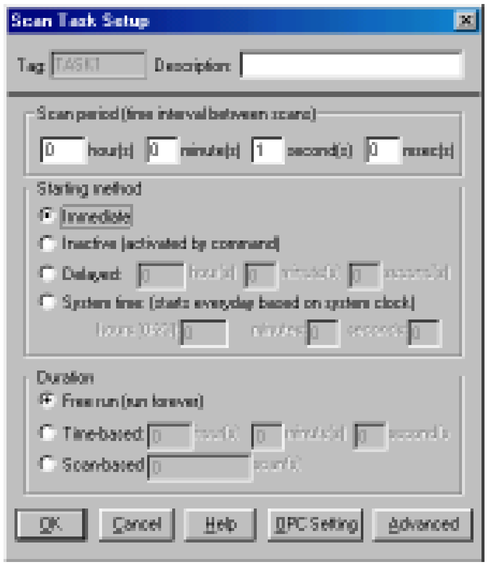


Figure 2-56: Setup TASK1 to be started immediately

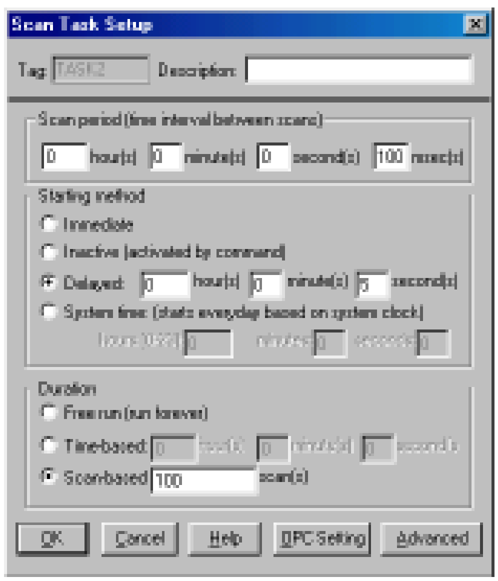


Figure 2-57: Setup TASK2 to be started after a 5 second delay

6. Refer Tutorial 1 Step 9 to save the strategy file as “TUTOR9.GNI”
7. Run multiple tasks by clicking on the Run menu and Start menu options in Task Designer.

Summary

Besides the tutorial examples, we also provide a lot of examples in the \Strategy directory. Please check the directory for the details.

3

Configuring Your System Functions With Task Designer

Overview

Advantech GeniDAQ provides an intuitive object-based graphical user interface (GUI) that simplifies control strategy and display setup. You simply select icon blocks from the toolbox, connect them, configure the parameters, and draw your dynamic display without any programming. A library of function block icons representing industry standard data acquisition, control, mathematical and display functions, lies at your fingertips.

Advantech GeniDAQ uses a data flow programming model to describe your task and control strategy. You intuitively construct and connect the function block icons to build your system. The execution order in GeniDAQ is determined by the flow of data between blocks. You can change the execution order of the blocks according to the needs of the system.

The Advantech GeniDAQ development environment allows you to decompose your system into several smaller modules or tasks. The modular design is very useful to develop and maintain a large and complicated system more easily. Each modular or task has its own properties, such as scan rate, start/stop method, and priority etc. With 32-bit Windows' multi-tasking capability, all tasks are running simultaneously at run time. Moreover, GeniDAQ allows you to prioritize your tasks to increase overall performance.

Contents

- Working with tasks
- Working with blocks
- Working with calculation blocks
- Working with file I/O blocks
- Working with DDE blocks
- Working with tag block and virtual tag
- Working with other blocks
- Summary

Working with Tasks

Depending on the characteristics of your control strategies, you can break down your strategies into several smaller modules. In GeniDAQ, a module is a task. GeniDAQ allows you to create multiple tasks. The number of tasks depends on the system resources. The elements of a task window are as below:

The elements of task windows include:

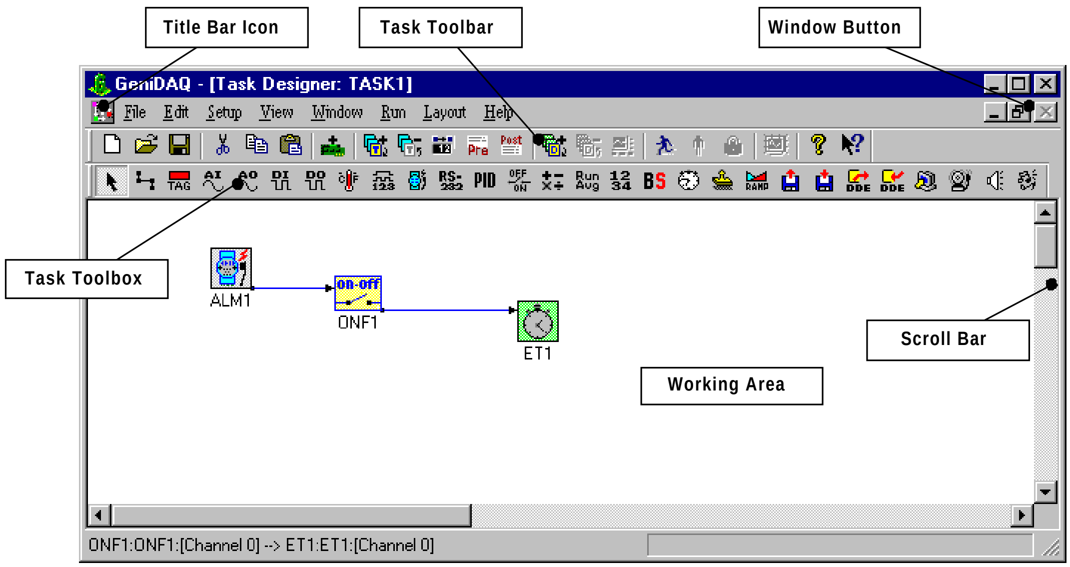


Figure 3-1: Main Parts of the Task Designer Window

Task Toolbox

Task blocks can be placed in the Task Designer configuration window by selecting them from the task toolbox. The following icons are available:

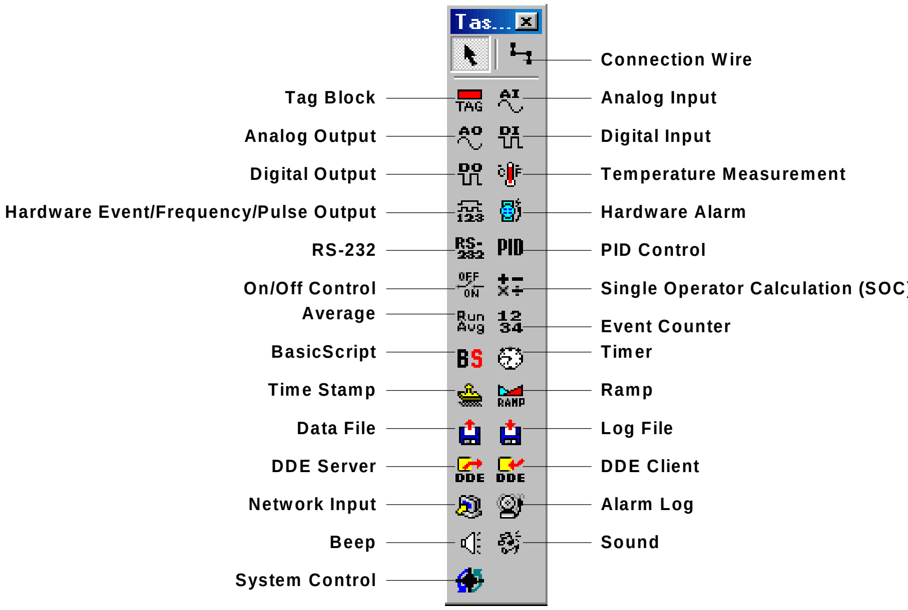


Figure 3-2: Task Designer Task Toolbox

- **I/O blocks** include the *Analog Input*, *Analog Output*, *Digital Input*, *Digital Output*, *Temperature Measurement*, *Hardware Event/Frequency/Pulse Output*, *Hardware Alarm* and the *RS-232* block. Please refer to Chapter 5, *Connecting Your Devices*.
- For information about the *BasicScript* block, refer to Chapter 10, *Advanced BasicScript Programming For Your Specific Needs*
- For information about the *Network Input* block, refer to Chapter 8, *Communicating Through TCP/IP Networking*.
- For information about the *Alarm Log*, refer to Chapter 7, *Monitoring Alarm and Event*.

Note: BasicScript, DDE Server, DDE Client and Sound block are not supported by the current version of Advantech GeniDAQ CE.

Creating and Configuring Tasks

GeniDAQ creates a task by default when you create a new strategy. You can create more tasks by selecting **File | Add/Delete | Add Task** from the main menu or you can delete a task by switching to the task (click **Window** from the main menu and then choose the task that you want to delete to make it active) and the selecting **File | Add/Delete | Delete Task** from the main menu.

Alternatively, you can use the **Add Task** and **Delete Task** toolbar icons to add a new task or delete the active task, respectively.

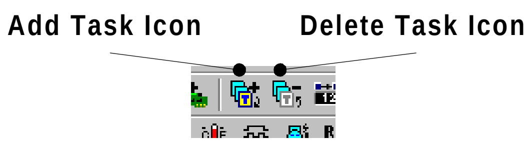


Figure 3-3: Add Task/Delete Task Toolbar Icons

After you create a new task, you should configure the runtime properties of the task. First you switch to the task window, then choose **Setup | Task Properties…** from the main menu.

Alternatively, you can use the **Task Properties** icon on the toolbar to open the *ScanTask Setup* configuration dialog box:

Task Properties Icon

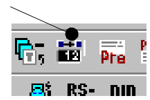


Figure 3-4: Task Properties Toolbar Icon

The *ScanTask Setup* configuration dialog box appears:

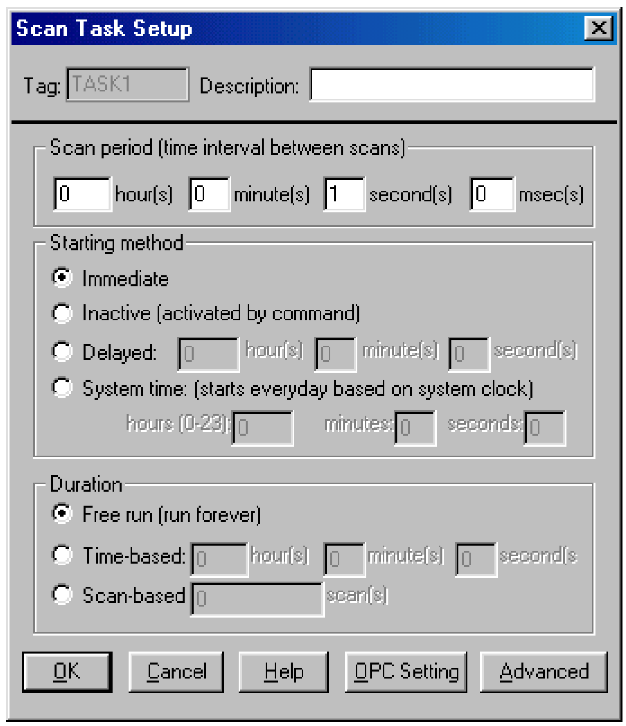


Figure 3-5: ScanTask Setup Configuration Dialog Box

ScanTask Setup Field Description

- *Tag* is the name assigned by GeniDAQ to refer to the task. This is the object name that should be called from BasicScript programming code.
- *Description* is a field that the user can enter to describe the task's function and purpose
- *Scan Period* is the time interval between successive retrievals of information used by the task
- *Duration* is the time when you want the task to run. *Free Run* will enable the task to run continuously, *Time-based* will run the task for a given period of time and *Scan-based* will run the task for a specified number of scans (i.e., retrievals of data).
- *Starting method* controls when the task starts to run. *Immediate* automatically runs the task when the runtime is enabled, *Inactive* keeps the task disabled until invoked by BasicScript code or *System Control* Block, *Delayed* enables the task after a period of time has elapsed from starting the runtime

and *System Time* uses the computer's real-time clock to enable the task.

- Clicking the **OPC Setting** button loads the *OPC Server Properties* configuration dialog box:

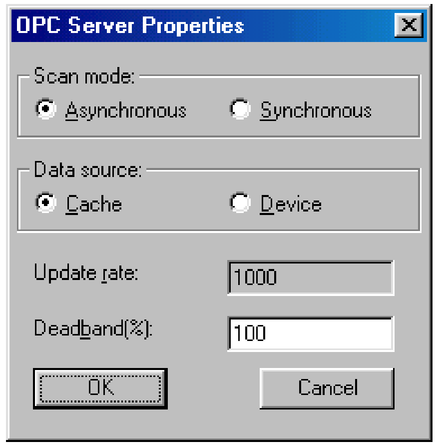


Figure 3-6: OPC Server Properties Configuration Dialog Box

- *Scan Mode*: Specifies asynchronous or synchronous mode scan. Asynchronous mode configures the OPC server to transfer data only when data is changed. It is more efficient. Synchronous mode always scans data from the OPC server.
- *Data Source*: Specifies the data source from cache or device when GeniDAQ requests data for the OPC server. The OPC server scans the physical device at a fixed rate (the Update Rate). The scan data will stored in memory. The cache option means the data is stored in the memory of the OPC server. It's more efficient. For a device data source, the OPC server retrieves data from the physical device.
- *Update Rate*: Specifies the update rate that the OPC server scans the physical device. 0 means the maximum speed of the OPC servers.
- *Deadband*: Specifies the percentage change in an item value when the OPC server causes a callback to GeniDAQ. 0 means the OPC servers will pass the data to GeniDAQ as long as the data is changed.
- Clicking the **Advanced** button will load the *Advanced Option* configuration dialog box:

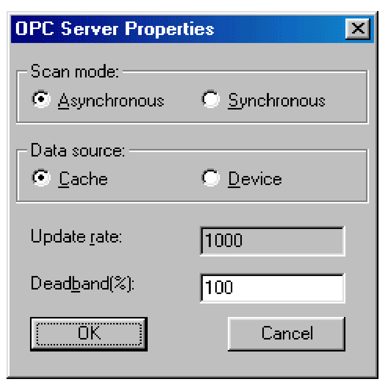


Figure 3-7: Advanced Option configuration Dialog Box

- *Priority* is the relative priority that the task has when using the operating system's multitasking features. The priorities are (from lowest to highest) are *Lowest*, *Below normal*, *Normal*, *Above normal* and *Time critical*.

Note: All items in a task have the same OPC properties. Each task has its own OPC properties.

Note: The default resolution for the scan period is 10 ms. The scan period must be mutiple of 10 ms. You can change the resolution under [system] section in Windows/GeniDAQ.ini file. TaskScheduleRes=10. The minimum is 5 ms. Be careful when changing it. It will affect your system's performance.

Working with Blocks

Once you have created a new task in your strategy, you are ready to design your control logic in the task's workspace.

Connecting Blocks

All block connections are made while the *Connection Wire* function is enabled. Enabling the *Connection Wire* function is accomplished by clicking the *Connection Wire* icon (the angled wire) on the Task Toolbox. When the function is enabled, a "roll of wire" appears instead of the standard mouse cursor. In this mode, connections can be started and terminated between various Task Designer blocks. Please check the input/output capacities and ata types for each block. Make sure the data type is matched between the source block and target block at connecting them.The following connections may be made:

Block to Block

This is the most common connection in a strategy. You simply click on the source block and then click on the target block. If the source block or target block provides multiple inputs or outputs, then you need to select one of them in the listbox.

Block to Display Item

When connecting a block to a display item, you have to open the *Display Designer* window, double-click the display item you want to connect to to open its configuration dialog box and then select the source block from the combo box in the dialog. This is normally done by configuring the *Input from* field in the configuration dialog box. This completes the connection from a block to a display item. For example, the following figure shows Numeric/String display item being configured to receive input from a Temperature Measurement block in TASK1.

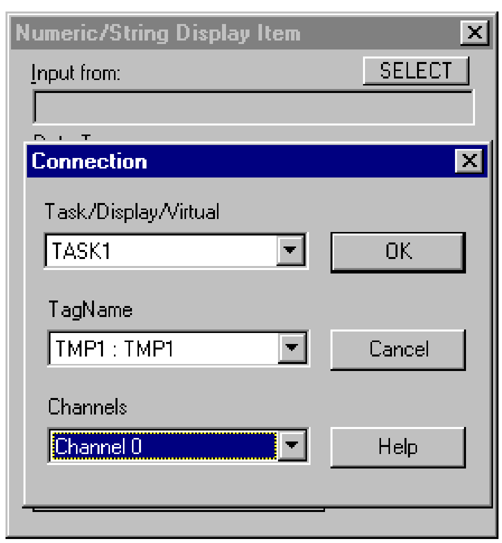


Figure 3-8: Connect a block to a display item

Display Item to Block

If the source of the connection is a display item then a Tag block in the Task toolbox needs to be created first in order to make a connection. After creating a display control item in Display Designer window, you have to create a TAG block in Task Designer window and configure it to represent this display control item. For example, the following figure shows a block TAG1 in the Task Designer being connected with a Slider control SPIN1 in the Display Designer.

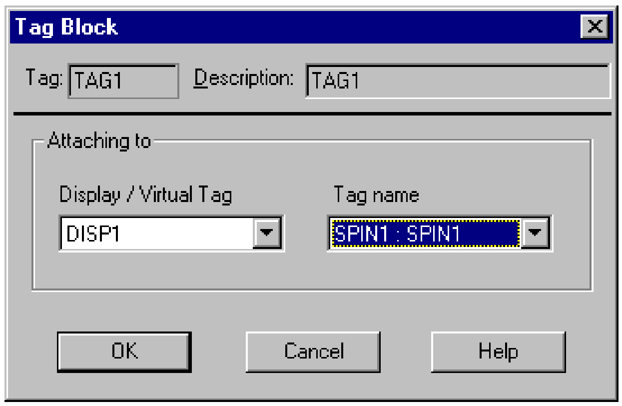


Figure 3-9: Connect display control item to Task block

Display Item to Display Item

This type of connection can be made between different display windows or in the same window. There are two ways to implement this type of connection. One is to create a first display item and then configure a second display item to link with the first. These two display items can be in different display windows. The other way is to link different display items through TAG in Task Designer. That is, one display item can pass data to the TAG of Task Designer, and another display item is configured to access this TAG.

Duplicating Blocks

If you want to duplicate a block (including its configuration settings) that is already part of your display, complete the following procedure:

1. Select the block with your mouse cursor. You can also select multiple blocks by dragging your mouse cursor around them.
2. Select **Edit | Copy** or click the **Copy** toolbar icon.
3. Select **Edit | Paste** or click the **Paste** toolbar icon.
4. The block(s) that you selected will be displayed in the task window.

Cutting Blocks

You can cut blocks from one task window and then paste them into another task window.

1. Select the block with your mouse cursor. You can also select multiple blocks by dragging your mouse cursor around them.
2. Select **Edit | Cut** or click the **Cut** toolbar icon.
3. Select **Window** on the main menu and then switch to the task target task window.

4. Select **Edit | Paste** or click the **Paste** toolbar icon.
5. The block(s) that you selected will be displayed in the task window.

Arranging Blocks' Execution Order

GeniDAQ is a data flow programming model. The execution order of the blocks depend on the data flow. GeniDAQ will assign the execution order automatically. You can also change the programming model to meet your needs. GeniDAQ provides two methods to change the order.

The *Task Designer* includes block sequence arrangement feature that shows the order of execution on all blocks. Users can rearrange the order of execution of the blocks (icons) under some restrictions. It shows the order of execution among blocks in the run-time program. The user selects **Order Layout** from the **View** menu to display the order number of each block. The order of blocks can be changed using the **Complete Reorder** and the **Exchange Order** options from the **Layout** menu.

Arranging Blocks' Layout

GeniDAQ provides "Align" and "Space Evenly" to arrange the task block layout.

Copying DDE Link

GeniDAQ provides "Copy DDE Link" and "Paste DDE Link" menu options to establish the DDE connections between GeniDAQ and other applications. After you select "DDE Server" blocks, including Analog Input, Digital Input, Temperature, and DDE Server blocks, you can select the "Copy DDE Link" menu option from the Edit menu to setup DDE linkage or other applications.

Pasting DDE Link

After copying DDE link, you select "DDE Client" blocks, such as Analog Output, Digital Output and DDE Client blocks. Then select the "Paste DDE Link" menu option from the Edit menu to paste the DDE linkage from another application.

Working with Calculation Blocks

The calculation blocks are used to perform some calculation. Their descriptions are as follows:

Single Operator Calculation Block

Block Information

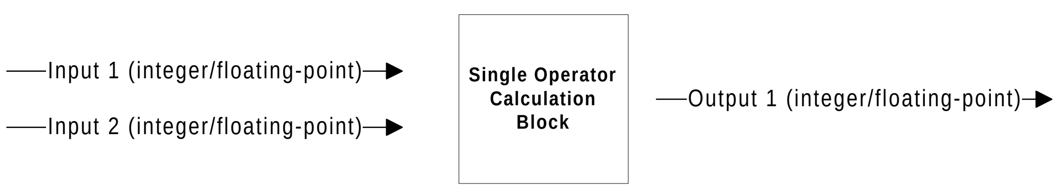


Figure 3-10: Single Operator Calculation Block Information

Interface

- *Number of inputs*: 2
- *Input type*: integer/float
- *Number of outputs*: 1
- *Output type*: integer/float

Description

This block does single operator math computations, such as add, subtract, multiply, etc. At least one block must be connected as an input block; this will be the first operand. The second operand can be either another block or a constant entered in the *Single Operand Calculation* block's dialog box.

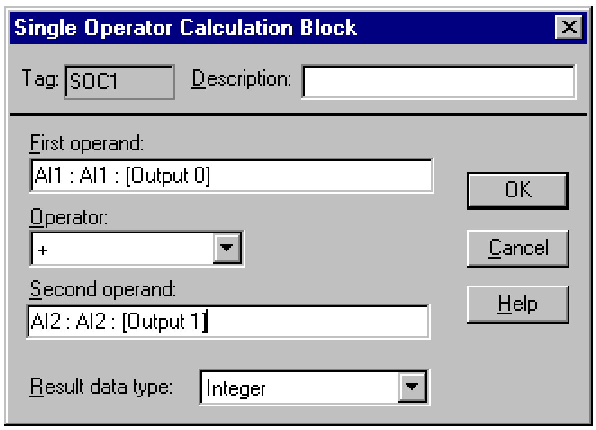


Figure 3-11: Single Operator Calculation Block

Field Description

Once two operands are selected, the order can be switched by pressing the Swap Operands button. This is important, since some operators, such as div or mod, will yield different results depending upon what values you use for OP1 and OP2 (first operand and second operand). The first block that is connected to the Single Operator Calculation block will be the default first operator in the dialog box. If you wish to have a different order, press the Swap Operands button. This will switch the order of operation of the SOC block.

The Result Data Type (output data type) can be either Floating Point (Real) or Integer.

Operator	Function (Output)
nop	Outputs 0 always
+	OP1 + OP2
-	OP1 - OP2
x	OP1 * OP2
/	OP1 / OP2
pow	OP1 ^ OP2
* mod	Outputs remainder of OP1 / OP2
* and	Logical AND of OP1 and OP2
* or	Logical OR of OP1 and OP2
* xor	Logical XOR of OP1 and OP2
max	Outputs the maximum of OP1 and OP2
min	Outputs the minimum of OP1 and OP2
>=	Outputs 1 if OP1 >= OP2, 0 otherwise
<=	Outputs 1 if OP1 <= OP2, 0 otherwise
>	Outputs 1 if OP1 > OP2, 0 otherwise
<	Outputs 1 if OP1 < OP2, 0 otherwise
equ	Outputs 1 if OP1 == OP2, 0 otherwise
neq	Outputs 1 if OP1 is not equal to OP2, 0 otherwise
abs	Outputs the absolute value of OP1
* not	Logical NOT of OP1
inv	Outputs 1 / OP1 (inverse of OP1)
sqrt	Outputs the square root of OP1
log	Outputs the log of OP1 (base 10)
ln	Outputs the natural log of OP1 (base e)
exp	Outputs e ^ OP1
jct	Junction block (see below)

Figure 3-12: Single Operator Calculation Block Operators and Functions

Operators with an asterisk "*" next to them require an integer operand. Some of the above mentioned operators need only one operand, while others need two. The logical operators (AND, OR, XOR) require two operands which must be integers. Other operators (ABS, NOT, INV, SQRT, LOG, LN, EXP, JCT) only require one operand, which can be either integer or floating point format, depending on the operator.

Some care is needed when providing input operands to certain operators. The MOD and "/" operators cannot have 0 (zero) as an operand to avoid a divide-by-zero situation. In the same way, some operators (SQRT, LN, LOG) require a positive value as an operand. Runtime errors will occur if these rules are not followed.

The JCT operator has a special function of simply outputting its input. It's useful for connection between a button display item and many other blocks. In the display editor, the button display item is designed to output to one and only one other block. Use of the JCT operator allows you to connect the button display item to many other blocks. by using the JCT operator as a branching point.

- *Wiring In*: Single Operator Calculation block accepts input data as operands for the operator.
- *Wiring Out*: Single Operator Calculation block outputs the calculated value to connected block(s).

Average Block

Block Information

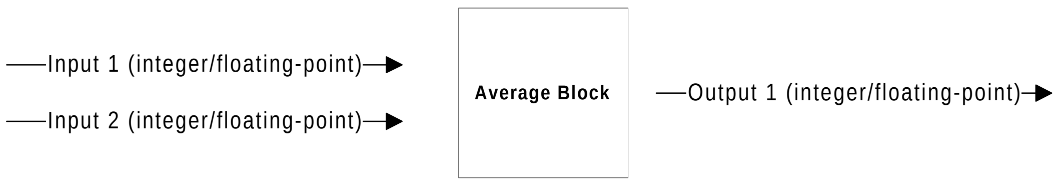


Figure 3-13: Average Block Information

Interface

- *Number of inputs*: 2
- *Input type*: integer/float
- *Number of outputs*: 1
- *Output type*: integer/float

Description

This block allows for input and output.

Field Description

There are two averaging methods available. If "Moving Average" method is selected, the input is averaged over a number of samples. The moving average is defined in the "Number of points to be averaged" field. If "Whole Average" method is used then the output is the average of all samples. For instance, if it is desired to average the present sample value with the previous 9 samples, then the user chooses the moving average method and uses 10 as the number of samples to be averaged. This will tend to smooth out noise and any extraneous signals. The Moving Average block should be placed between the sampling block and the next logical block, i.e. the display block, etc.

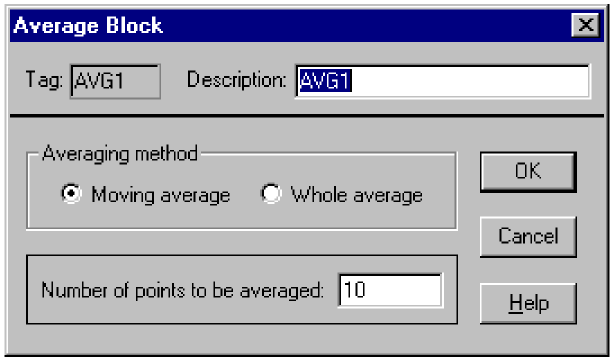


Figure 3-14: Average Block Configuration Dialog Box

- *Wiring In*: Average Block accepts the wiring input data as sampled data and performs calculation.
- *Wiring Out*: Average Block outputs the average value to the connected block.

On/Off Control Block

Block Information

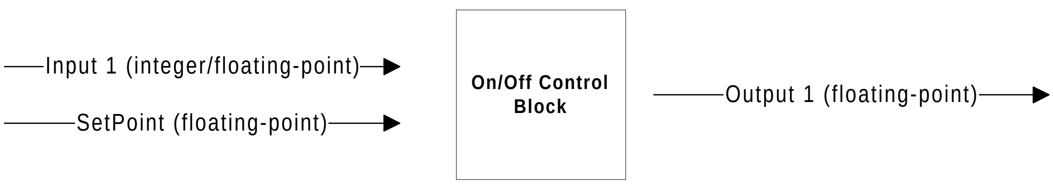


Figure 3-15: On/Off Control Block Information

Interface

- *Number of inputs*: 2 (input and setpoint)
- *Input type*: integer/float, float
- *Number of outputs*: 1
- *Output type*: float

Description

This block allows both input and output. The input consists of a measured value (feedback) to be controlled to within a certain tolerance (deadband), determined by a setpoint (either dynamic or static). The output is either digital low or high, depending on controller output.

Theory

Non-proportional control, in which the controlled process input is either fully ON or fully OFF, depends on whether the measured value (feedback) is above or below the control point (setpoint) deadband.

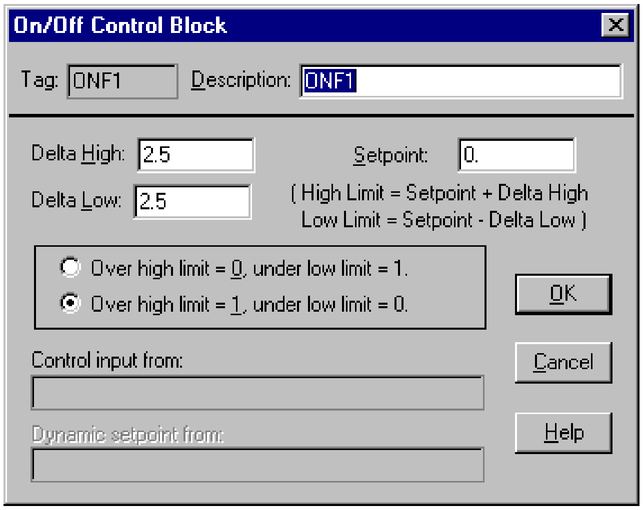


Figure 3-16: On/Off Control Block Configuration Dialog Box

Setpoint

The On/Off setpoint value, or desired value. This value can be changed on the fly (dynamic) by specifying a ramp or other block to be used as the dynamic setpoint. If there is no dynamic setpoint from connection, a constant setpoint will be enabled. You can enter the static setpoint.

Delta Low

Low value for generation of the deadband. Lower section of deadband is equal to Setpoint - Delta Low.

Delta High

High value for generation of the deadband. Upper section of the deadband is equal to Setpoint + Delta High.

In addition, you have the option of outputting either a 0 or a 1 value for inputs over the high limit, which would make the output 1 or 0, respectively, for inputs under the low limit.

If no deadband is desired, simply set the delta low and delta high values to zero. In this way, ALARM CONTROL can be achieved using a static setpoint.

- *Wiring In*: On/Off Control Block accepts data as input data or setpoint data.
- *Wiring Out*: On/Off Control Block outputs either digital low or high to connected block.

Note: *The \Strategy\OnOff example demonstrates how to use On/Off block. Please refer to it for the detailed.*

PID Control Block

Block Information

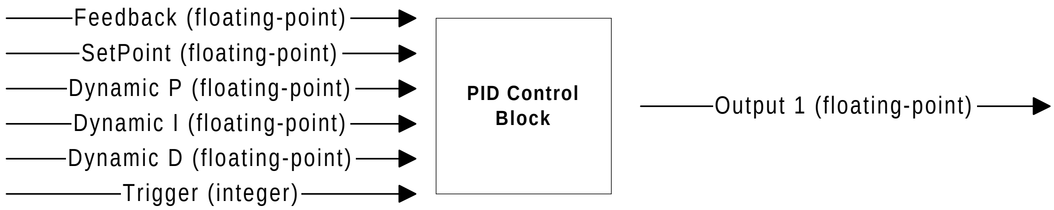


Figure 3-17: PID Control Block Information

Interface

- *Number of inputs*: 6 (feedback, setpoint, dynamic P, dynamic I, dynamic D, and trigger signal)
- *Input type*: float, float, float, float, float, integer
- *Number of outputs*: 1
- *Output type*: float

Description

This block allows for input and output. The input consists of a measured value (feedback) to be controlled by the setpoint value (either dynamic or static). The block's output is the controller output.

Theory

A controller is capable of receiving a signal from a sensor (usually temperature) within a process and regulating an input to that process in order to maintain a selected value or set point/control point.

The PID controller is the most widely used type of process controller. It is the ability to tune its control action to specific time constants and therefore to deal with process changes over time. These features have earned the PID controller wide acceptance. To perform the control, the object is to measure the difference (error) between the desired value (setpoint) and the measured value (feedback), and reduce that error. The PID controller is the most efficient type of process controller.

The control functions of the PID controller may be separated according to application requirements into three types. The three functions are: one, two, and three mode control.

One Mode Control (Proportional)

This is the simplest type of proportional control. Using this method, the controlled process input is regulated to a value proportional to the difference between the control setpoint and the measured value. This controls the proportional band. The larger the value of the proportional constant, the harder the system will react to differences between the setpoint and the actual measured value. A simple proportional controller may be achieved by setting the reset rate (I) and derivative times (D) to zero.

Two Mode Control (Proportional/Integral)

This method introduces an additional reset control action depending upon the accumulated error x time product (integral). The sum of the error and reset signals continuously act to make the actual error signal smaller, stopping when the measured value reaches the desired control setpoint. A PI controller is created by setting the derivative (D) value to zero.

Three Mode Control (Proportional/Integral/Derivative)

This mode uses an additional rate sensing (derivative) action, which reduces the tendency to overshoot a control setpoint. This is done by anticipating the approach of a zero value error signal and initiating a control response reversal before the measured value (usually sensed temperature) actually gets there. Proper use of the derivative term can result in much faster process response.

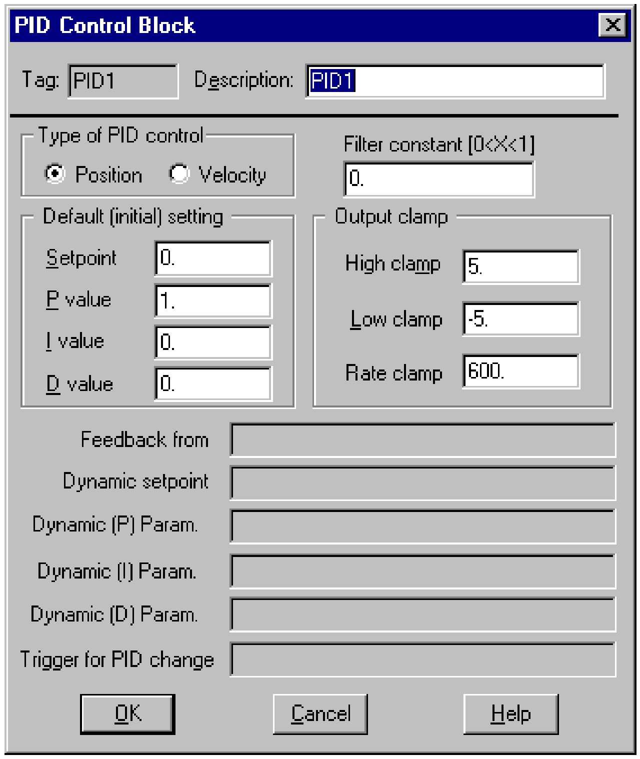


Figure 3-18: PID Control Block Configuration Dialog Box

Type of PID control

The output of the position method is an absolute value for setting the controlled variable. Since the output of the velocity method is a relative amount to change the controlled variable. For example, if the current value of the controlled variable is 5, and the output of the PID position algorithm is 2, then the controlled variable is set to 2. If the current value of the controlled variable is 5, and the output of the PID velocity algorithm is 2, then the controlled variable should be set to 5+2=7.

- *P*: PID proportional control constant
- *I*: PID integral mode gain constant
- *D*: PID derivative mode gain constant

The P, I, D parameters can be set on the fly (dynamic) by specifying data from other blocks as the dynamic inputs. The change of any of the P, I, D parameters is not effective until the Trigger for PID change is triggered.

- *Trigger for PID change*: If you use dynamic P, I, D parameters, you have to connect a value from another block to the input (Trigger for PID change) to activate the PID changes. In other words, dynamic P, I, D and Trigger should all be connected. If they are not, the control system will not work. When dynamic values are used, static values will be disabled and ignored.
- *Low Clamp*: Low clamping value for output. Prevents voltage swings from exceeding the range of the hardware used for the control (usually D/A converter).
- *High Clamp*: High clamping value for the output.
- *Rate Clamp*: Rate of change clamp for output, measured in units/minute. If there is a large change in the setpoint or feedback, the rate clamp parameter will prevent the PID output value from making a change larger than the hardware is able to support. Instead the output value will be limited to change at the specified rate.
- *Filter Constant*: The value for the measured variable can be automatically filtered if it is noisy. Filter value of 0.0 means that no filtering takes place. As the values increase toward 1.0, the filtering effect becomes more and more pronounced.
- *Setpoint*: The PID setpoint value, or desired value. The value can be changed on the fly (dynamic) by specifying a ramp or other block to be used as the dynamic setpoint. If a constant setpoint is desired, enter the static setpoint.
- *Dynamic Setpoint*: If an outside value is connected to this entry, the setpoint value becomes dynamically changed by the outside value instead of using the constant value. When the dynamic setpoint is active, the static one is disabled and ignored.
- *Wiring In*: PID Control block accept wiring input data as Feedback, Setpoint, P parameter, parameter, D parameter and Trigger for PID change value and use them in block configuration.
- *Wiring Out:* PID Control block outputs the controller value to a connected block.

Note: The \Strategy\PID example demonstrates how to use PID block. Please refer it for the detailed.

Note: The PID algorithm is as below:

```
U(n) = P*e(n)+P*I*TsSe(k)+((P*D)/(6*Ts))*(e(n)+3(e(n-1)-e(n-2))-e(n-3))
```

Where:

- U(n): PID block output at sample time n
- P: Proportional parameter (Gain)
- I: Integral parameter (Reset)
- D: Derivative parameter (Rate)
- e(n): Setpoint - Feedback, error at sample time n
- Ts: Sample period (task’s scan time) in minute

Event Counter Block

Block Information

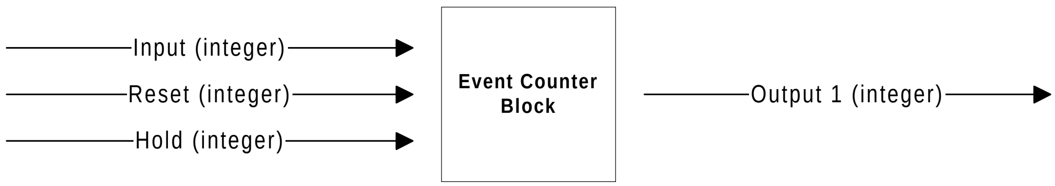


Figure 3-19: Event Counter Block Information (4-h.vsd)

Interface

- Number of inputs: 3 (input, reset, and hold)
- Input type: integer, integer, integer
- Number of outputs: 1
- Output type: integer

Description

This block has both input and output capability. A software event counter that counts digital rising edges (digital high events) from any block supplying digital information (1's and 0's). The block's output can be sent to another block. Each count is performed with each scan; therefore counting speed is equal to the sample period of the system. By connecting a high digital value to the reset input, the count can be reset to its starting value and counting is stopped. A low value to the reset input will enable counting. If reset input is not connected, this value is simply treated as a low. By applying a high digital value to the hold input, the count may be temporarily held at the current value. A low on the hold input will resume counting.

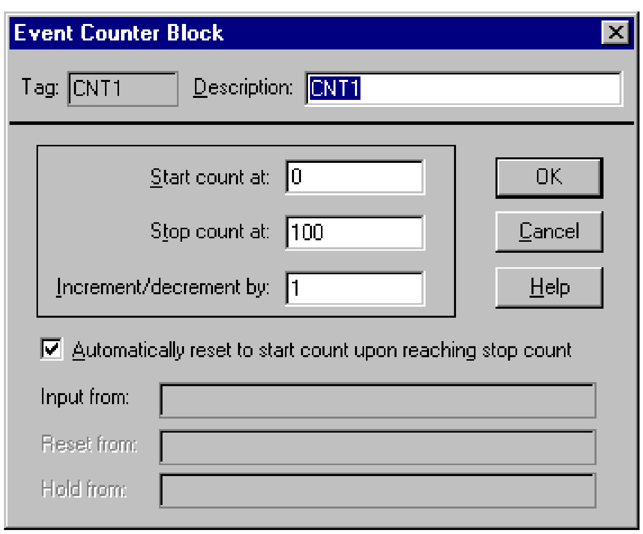


Figure 3-20: Event Counter Block Configuration Dialog Box

Start Value
An integer value at which the Counter will start. (maximum 65535)

Stop Value
An integer value at which the Counter will finish. The value can be above or below the Start value. (maximum 65535)

Increment/Decrement
Each integer up/down count will be equal to this value.

Input from
The block from which you would like to count pulses (rising edges).

Reset from
The trigger block (any digital type block) used to apply a digital high/low to reset/start the counter. A digital high applied to this input resets the counter and stops counting. A digital low allows counting to occur. No reset input is treated as a low input; counting will free-run in this case.

Hold from
Any digital type block used to hold the count at the current value. A high digital signal applied to this input stops counting at the current value. A low applied to this input will enable/resume counting. No hold input is treated as a low input.

- *Wiring In:* Event Counter Block accepts data as input, reset and/or and then displays the data in the configuration dialog box.
- *Wiring Out:* Event Counter Block outputs the current counter value to connected block(s).

Working with File I/O Blocks

File I/O blocks are used to perform file I/O operation. The blocks include

Data File Blocks

Block Information

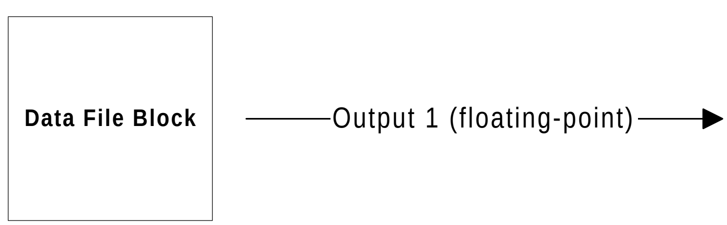


Figure 3-21: Data File Block Information

Interface

- *Number of inputs*: 0
- *Input type*: none
- *Number of outputs*: 1
- *Output type*: float

This block has output capability. By using this block, data can be retrieved from a file. The data will be retrieved one line at a time with each system scan (sample). When the end of the data is reached, it will be re-scanned (loop back will occur). An ASCII file must be created containing the data formatted into one column of either integer or floating point values. Specify the filename in the associated dialog box. Connect the Data file block to the block to where data will be sent.

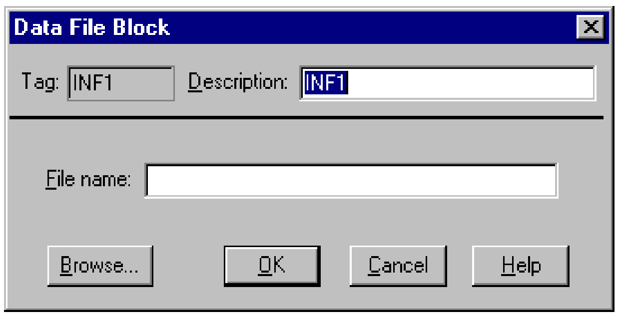


Figure 3-22: Data File Block Configuration Dialog Box

- *Wiring In*: No input allowed
- *Wiring Out*: This block passes the value from data file to connected block.

Log File Blocks

Block Information

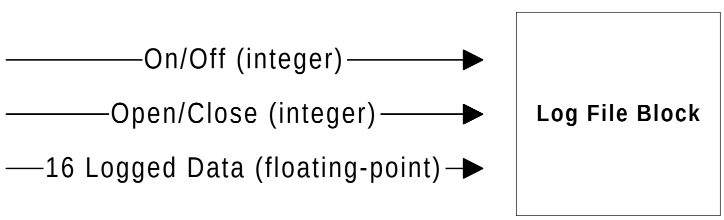


Figure 3-23: Log File Block Information

Interface

- *Number of inputs*: 18 (on/off, open/close, and 16 inputs for logged data)
- *Input type*: integer, integer, float (for 16 inputs)
- *Number of outputs*: 0
- *Output type*: none

This block has input capability. The block allows data from inputs to be logged to a file in multiple column format. Each block from which data is to be logged corresponds with one column in the file.

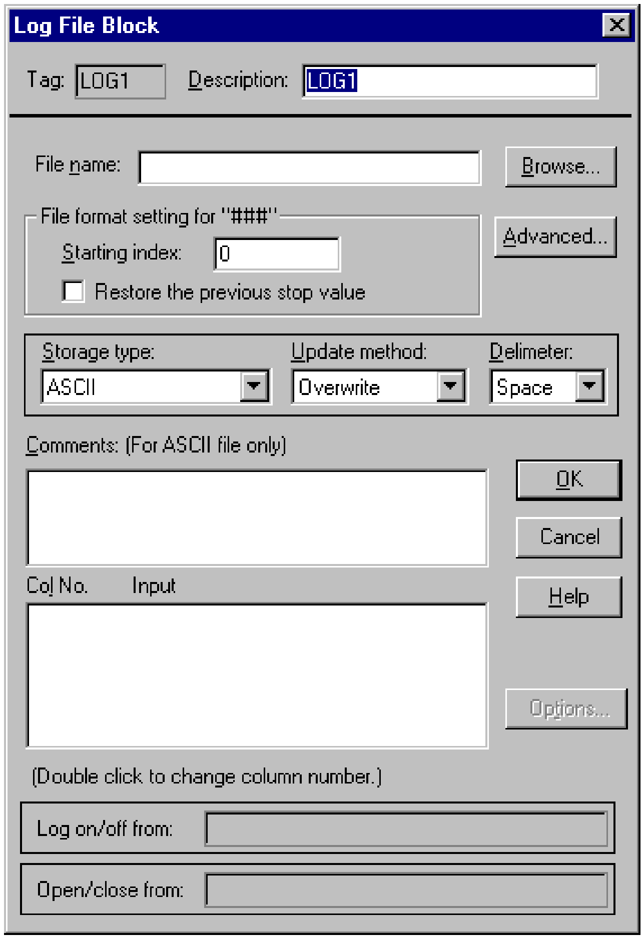


Figure 3-24: Log file Block Configuration Dialog Box

The Restore the previous file name option, if checked, let you save the last used file name when you stop the run-time. A new file name follows the saved file name will become the file name at the next run. This option is useful only when the file name contains wildcard characters. Note the filename will be saved only when you stop the running session properly.

You can specify the storage type (format) for the file as ASCII, binary float, byte, integer, or long integer.

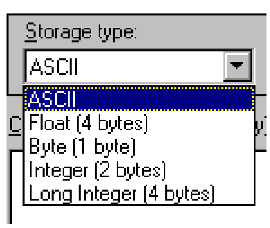


Figure 3-25: Select data storage type

The update method can be either to append new data or to overwrite old data.

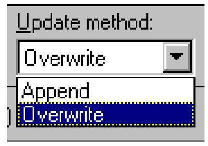


Figure 3-26: Select file update method

The delimiter between data in log file can be space, comma or tab.

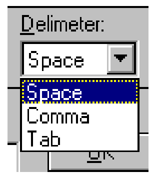


Figure 3-27: Select the delimiter between data

You can include a header and comments at the beginning of your file if you desire. You can specify the width, in characters, of each column of data, along with decimal point placement. For each input to be logged, you can specify to which column number the input block's data will be sent. When the file log block is selected, all input block tag names are displayed with the default column number starting at one (1).

You can change the column numbers by double clicking on each input tagname so that a dash (—) is displayed instead of the column number. Double clicking again on each input's tagname, starting at the one you want to be logged as column one (1) in the file, will cause them to be numbered the way you want. By pressing the Options button, you can specify each column's width (in characters), desired header information and decimal point format. For example, if the format is specified as "0.000", the output would be displayed as "9.876. If you specify the output as "0.0", the output value would be 9.8.

The "Log On/Off" input, if connected, is used to control the logging of the input data. A nonzero input allows input data to be logged, while a zero input suspends the data logging process. You can use this to select the right data to be logged or to take one of every N readings.

The "Open/Close" input, if connected, is used to control the opening and closing of the log file. This option only works with a wildcard (*) file name, since opening a file will trigger the block to use the next file name based on the wildcard characters. The Advanced button will allow you to set up a total of 16 possible combinations for opening and closing the file (4 options for opening and 4 options for closing).

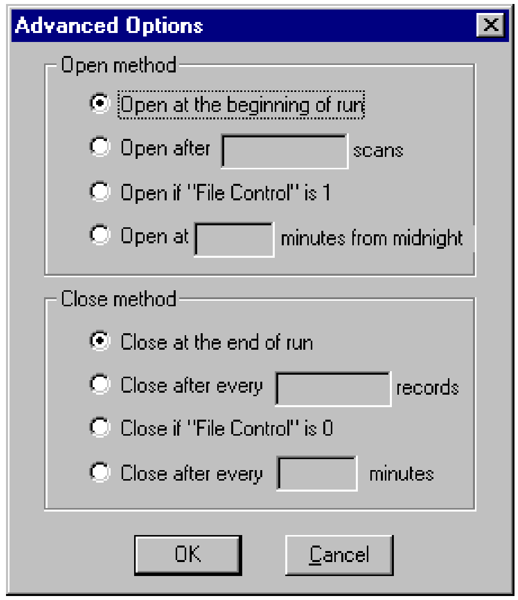


Figure 3-28: Log file open/close methods

The four OPEN options are as follows:

A. Open at the beginning of the run: The file is opened immediately when the run is started.

B. Open after every N scans: GeniDAQ waits until N scans have passed to open the file.

C. Open if "File Control" is 1: "File Control" is a control signal to the Log File Block from another block. The file is opened when this signal is 1. The file is closed when this signal is 0.

D. Open at N minutes from midnight: This option is good for doing a job that is repeated daily at the same starting time. This allows the file to be opened at N minutes from midnight for the first file-open. The subsequent files are controlled by file-close options.

The four CLOSE options are as follows:

A. Close at the end of the run: This is the same as the original file-close of version 1.0. The file is closed immediately after the run is stopped.

B. Close after every N records: GeniDAQ waits until N records have been recorded to close the file.

C. Close if "File Control" is 0: "File Control" is a control signal to the Log File Block from another block. The file is closed when the signal becomes 0. The next file is opened when the signal becomes 1 again.

D. Close after every N minutes: Starting from the moment the first file is opened, this option allows the file to be closed every N minutes. The next file is opened right after the previous file is closed, if needed.

In order to generate a different filename each time a file is created, some of the OPEN/CLOSE options listed above require wildcard character(s) in the filename. The only wildcard character supported is the # (pound sign). The “#” character can appear at any position in the standard DOS file name in the place of a regular character. It will be replaced by a digit (0-9) to form a real file name. Use more “#” characters together if you need a larger number of files. A wildcard such as “FILE###.LOG” can generate 1000 file names from “FILE000.LOG” to “FILE999.LOG”. Make sure there are enough digits there for your strategy. All wildcard characters must be together (contiguous).

Valid filename examples using wildcards:

```
MYFILE##.LOG      MY###R.LOG       MYFILE.###
MYFILE.L##        ########.TXT     #RECORD.TXT
```

Invalid filename examples using wildcards:

```
MY#FILE#.LOG      # sign should be adjacent to each other
FILE##.##T        # sign should be adjacent to each other
```

- *Wiring In*: Log File Block accepts input data as logged data, open/close control and data logging on/off. This data is displayed in the block configuration dialog box.
- *Wiring Out*: No output available

Note: The \Strategy\LogFile example demonstrates how to use the Log File block. Please refer to it for the detailed.

Working with DDE Blocks

You can use DDE blocks to share data with other applications, such as Excel or PLC’s DDE drivers. DDE allows you to exchange data between GeniDAQ and other Windows applications.

There are two DDE blocks included in GeniDAQ, known as DDE Server, and DDE Client. In addition, there are four blocks that have DDE capability built into them. These include the Analog Output, Digital Input, Digital Output, and Temperature Measurement blocks. For these four blocks, DDE capability is accessed through the dialog box that appears when you setup the blocks.

DDE Server Block

Block Information

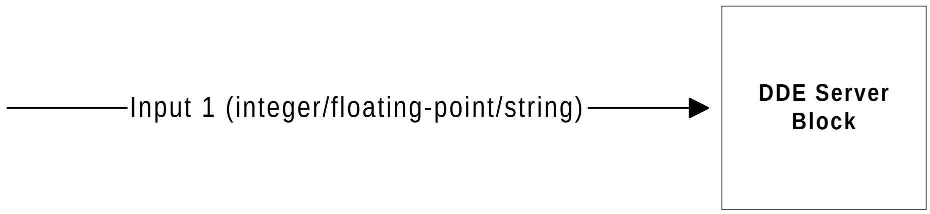


Figure 3-29: DDE Server Block Information

Note: The version of Advantech GeniDAQ CE doesn’t support DDE Server Block.

Interface

- *Number of inputs*: 1
- *Input type*: integer/float/string
- *Number of outputs*: 0
- *Output type*: none

The DDE Server block provides data from GeniDAQ to another Windows application. Since DDE uses a broadcast-type communication, the DDE server will "publish" its data, and other applications have the responsibility to find it and use it as they wish. When a block is connected to the DDE server block, a link is established. Double clicking on the DDE server block will tell you the name of the Service, Topic and Item. This information is what the other applications will need to locate a link that you create in GeniDAQ.

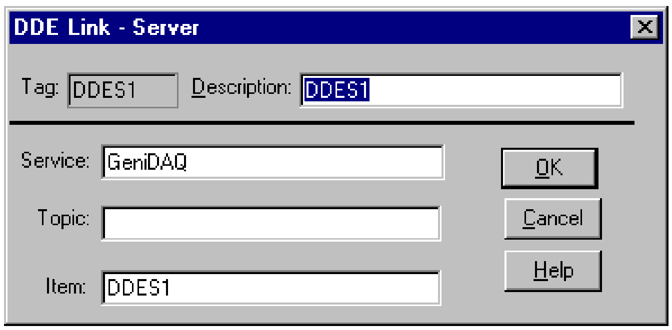


Figure 3-30: DDE server block setting

The Service, in this case, is GeniDAQ. It is the program name of the Windows application that is providing the data.

The Topic is the name of the particular file that is providing the data. In GeniDAQ, it would be the name of your particular strategy (*.GNI). The extension (.GNI) is not needed here, only the name of the strategy. For example, if your strategy were named DDEDEMO.GNI, the topic would be DDE-DEMO. Keep in mind that an untitled strategy will not be able to provide data through DDE; it must be a unique, saved filename.

The Item is the tagname of the block that is providing the data (DDES1, DDES2, DDEC1, etc.). Other valid tagnames are AI1, DO3, etc. (first Analog input block, third digital output block, third elapsed timer block, etc.). These I/O blocks have DDE capability built-in to their dialog boxes. It is important to realize that these are the tagnames that GeniDAQ assigns to the particular blocks, and not the description that the user can change.

These three fields are what the other Windows applications will be looking for. Usually, most other Windows applications will separate the fields in the following manner:

```
Service|Topic!Item
```

Note that this is not a universal standard, only common practice. You should refer to the documentation for your particular Windows application to learn how DDE syntax is implemented for each program.

- *Wiring In*: Accepts the input data and pass this data to other windows DDE client applications. One data source is allowed. If there is more than one input, "The input already connected" message will be displayed.
- *Wiring Out*: Passes the input data to a connected block directly.

DDE Client Block

Block Information

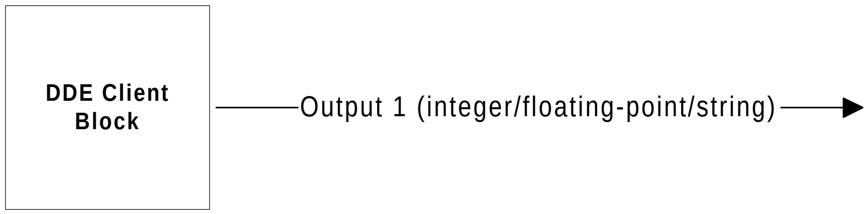


Figure 3-31: DDE Client Block Information

Interface

- Number of inputs: 0
- Input type: none
- Number of outputs: 1
- Output type: integer/float/string

The DDE Client block receives data from another Windows application. This block will require that you input the Service, Topic, and Item for the application that will be providing data to GeniDAQ. It may also be necessary for other Windows applications to be set up to publish data. You should refer to documentation provided with the application for this information.

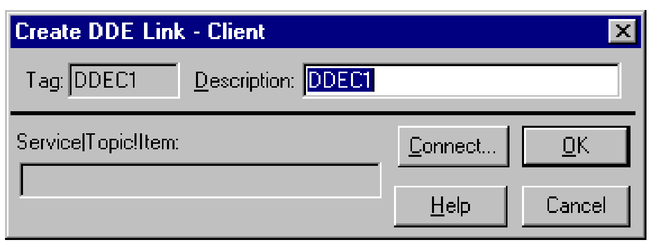


Figure 3-32: DDE Client block

The DDE client block will receive data from another application, then input that data to the blocks that are connected to the DDE client block via the connection wire. Any number of blocks can be connected to a DDE client block, and they can all use the data that the DDE client block is receiving from the server application.

To setup a DDE client block, your other application should be running in the background. Place the DDE client block on the Task Designer workspace, and connect it to the blocks to which you wish to input data (from the DDE client block or from another application). Next, double click on the DDE client block. This will invoke the DDE client dialog box. Within this dialog box, click on the Connect... button. In the dialog box that appears (Create DDE Link), you should see your application name in the box under Service. All of the applications that are currently running which have DDE capabilities should be displayed in the Service box. It is possible that some applications will not be shown. If the other applications are listed, click once on the Service that you wish to use, which will then place the available Topics in the next box under Service Topics. Click once on the appropriate topic, which will then place the available Items in the box under Topic Items. Clicking on the OK button after going through this sequence will place the service, topic and item in the format

```
Service|Topic!Item
```

in the Create DDE Link dialog box. The link is then created and you can receive data from the other application.

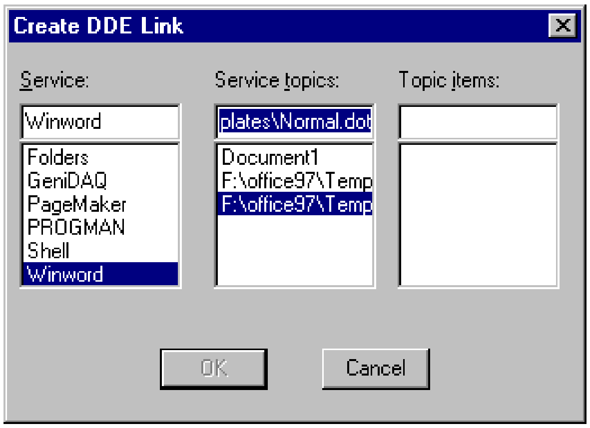


Figure 3-33: Create DDE links

If your other application's Service, Topic and Item is not shown in the list boxes and you want to exchange data with them, you must manually enter the Service, Topic and Item in the appropriate Text Box within the DDE Client dialog box.

- *Wiring In*: GeniDAQ will display a window with the error message "Cannot accept input".
- *Wiring Out*: Passes the input data from another DDE server Windows application to a connected block.

Note: *The \Strategy\Dde example demonstrates how to use DDE Server and Client blocks. Please refer to it for the detailed.*

Note: *The current version of Advantech GeniDAQ CE doesn't support DDE Client block.*

Working with Tag Block and Virtual Tag

Tag Block

Block Information

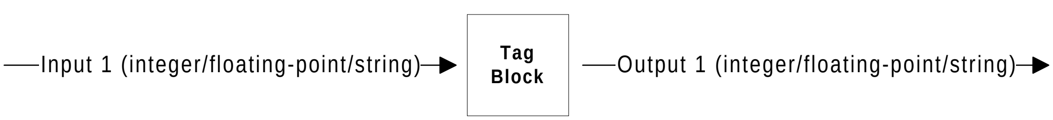


Figure 3-34: Tag Block Information

Interface

- *Number of inputs*: 1
- *Input type*: integer/float/string
- *Number of outputs*: 1
- *Output type*: integer/float/string

The tag block is used to link a task block to a display control object or a virtual tag. GeniDAQ allows you to create your own software tags. You can store some information in it and share it among multiple tasks.

Description

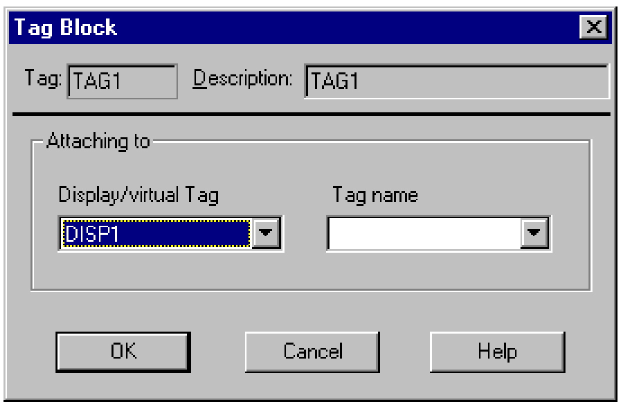


Figure 3-35: TAG Block Configuration Dialog Box

This block is used to link a task block to a display item or a virtual tag. The value of a display control item can be passed to other blocks. Virtual tags must be selected from within the TAG block. Once the virtual tag is thus linked, its value can be applied to other task blocks.

- *Wiring In*: TAG block accepts the input value from the display window.
- *Wiring Out*: TAG block passes the values to connected block(s).

To link a task block to a display control object using a tag block:

1. Place a tag block on the *Task Designer* configuration area.
2. Right-click the tag block. The *Tag Block* configuration dialog box opens.
3. Select the display that contains the control object that you want to link in the *Display/Virtual Tag* list box.
4. The *Tag Name* list box will show the control objects in the selected display that can be linked to your tag block. Select the object from the list.

Virtual Tag

Virtual Tag is a powerful feature that provides the ability to create customized tags in Task Designer. The virtual tag is created by Task Designer and stored in data center as other built-in blocks. The virtual tags are globally available to all tasks, and can thus be used to share data among multiple tasks.

Add/Delete Virtual Tag

To create a virtual tag, select the Add/Delete Virtual Tag option from the Setup menu. A dialog box will be displayed to add/delete virtual tags.

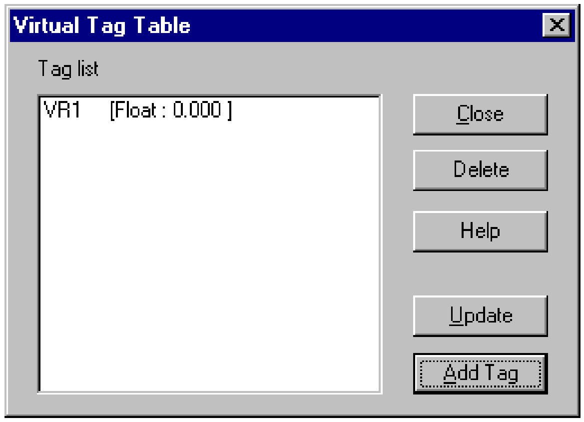


Figure 3-36: Virtual Tag Table

When the dialog box appears, a list of available virtual tags will be displayed in the dialog box. To add a virtual tag, key in the name of the new virtual tag at the input line and press the Add button. A new virtual tag will be added to the list of available virtual tags. After adding, you can press the OK button to exit the dialog box. To Delete a virtual tag, click on the same menu and option as used to add a virtual tag, select the desired virtual tag in the available listing and press the Delete button.

Using Virtual Tag in Task Designer

Once created, virtual tags are not displayed in or added to the Toolbox. It is an internal tag block. You have to use and configure a TAG block to link with it. The configuration is displayed in the dialog box below. Choose VIRTASK in the Task/Display field of dialog box and select the name of the virtual tag in TAG field. The configuration is then complete. After linking with a TAG block, you can connect the virtual tag with other blocks in Task Designer which have input and output capabilities. That is, virtual tags can accept data from other blocks, such as an AI block, and output values to other blocks, such as DO blocks.

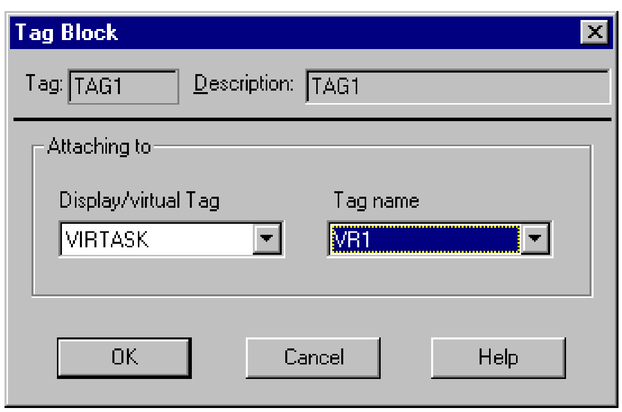


Figure 3-37: Link Virtual Tag to Tag block

Using Virtual Tag in Display Designer

Virtual tag values can be displayed on screen by configuring the display item to link with virtual tag. Refer to the figure below. Choose VIRTASK in Task/Display field of the dialog box and select the name of the virtual tag in the TAG field. The configuration is then complete.

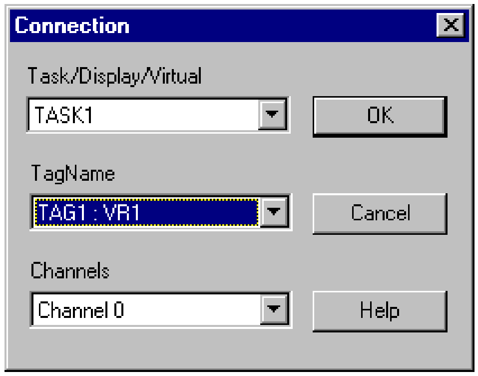


Figure 3-38: Use Virtual Tag in Display Designer

Using Virtual Tag in BasicScript

Virtual tag is same as other blocks in BasicScript. You can get tag values and set tag values. The difference between virtual tag and task blocks is that task block values do not read back to GeniDAQ tasks from data center after setting new values. Virtual tag values can be read back to GeniDAQ tasks from the data center. Because of this difference, you can retrieve data from BasicScript programs or other applications for GeniDAQ tasks or displays.

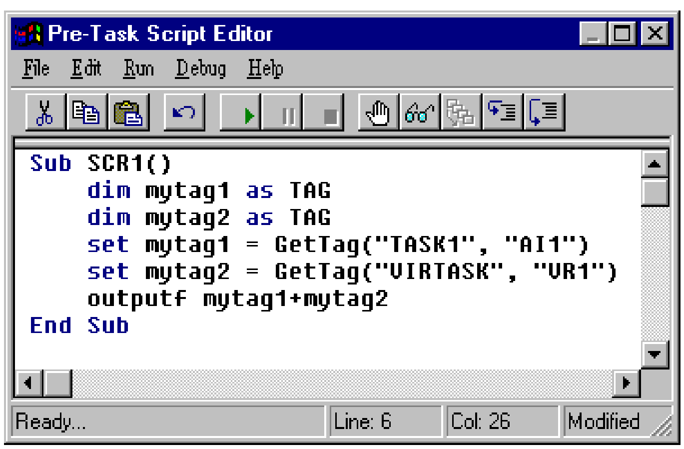


Figure 3-39: Use Virtual Tag in BasicScript

To link a tag block to a virtual tag:

1. Place a tag block on the *Task Designer* configuration area.
2. Right-click the tag block. The *Tag Block* configuration dialog box opens.
3. Select the *VIRTASK* virtual task in the *Display/Virtual Tag* list box and click the **OK** button.

Working with Other Blocks

Timer Block

Block Information

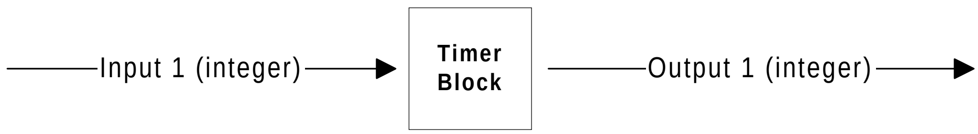


Figure 3-40: Timer Block Information

- *Number of inputs*: 1 (reset)
- *Input type*: integer
- *Number of outputs*: 1
- *Output type*: integer

Interface

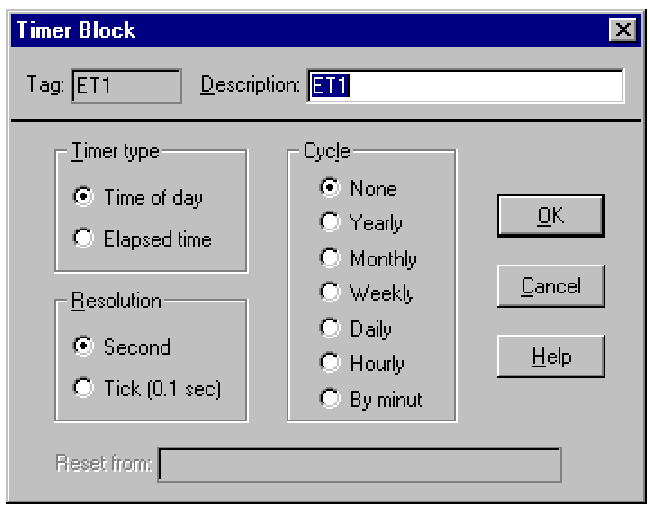


Figure 3-41: Timer Block Configuration Dialog Box

Description

Accepts inputs (for reset purposes) and also allows outputs. Time can be absolute, or elapsed, and resolution can be in ticks (0.1 seconds) or seconds. The time cycle range can be set from each minute to each year. Output (elapsed or absolute time) can be sent to another block.

The Timer Block's output is a long integer from 0 to 4294967295. This block is very useful for any type of control strategy that involves time as an element.

The unit of the timer's output value is in either seconds or ticks, depending upon the resolution that you choose. Because of the constraints of the Windows environment, it is difficult to get better resolution than that provided here.

The output of the timer block is cyclic if one of the cycle options is chosen. For example, the output of the timer block with "Elapsed time" type, "Second" resolution and "Minutely" cycle goes from 0 to 59 and back to 0. The same block with hourly cycle will output 0 to 3599 and back to 0.

The timer block can be reset by another block; a value of 1 input to the timer block reset will reset the timer.

For a timer block with Time-Of-Day (absolute) type, the output doesn't start from 0 at the beginning of the run. It gives the number of seconds or 1/10 seconds since the boundary of the cycle, according to the computer's clock. For example, the output of an hourly timer (with seconds resolution) is 0 every hour on the hour, then incremented to 1,2,3, ... ,3599, then back to 0 on the next hour. The boundary of various timer cycles are listed as follows:

- YEARLY: Starts from 0 at 00:00:00 AM January 1st every year.
- MONTHLY: Starts from 0 at 00:00:00 AM the first day of each month.
- WEEKLY: Starts from 0 at 00:00:00 AM on Sunday every week.
- DAILY: Starts from 0 at 00:00:00 AM every day.
- HOURLY: Starts from 0 every hour on the hour.
- MINUTELY: Starts from 0 every minute on the minute.

It's easy to calculate the actual time based on the cycle type. For example, the weekly timer outputs 86400 at 0:00 AM Monday morning and 518400 at 12:00 PM Friday midnight. You can use this value as input to the User Program Block and use it to turn something off during the weekend or turn something on during the weekdays. You can also use several timers with different cycles to do more complicated timer control.

See TIMER.GNI (in the \Strategy\Timer directory) as an example of how to use the Timer Block. This strategy makes 3 beeps at 0th, 2nd and 4th second of every minute for the first 5 minutes of every hour Monday through Friday.

- *Wiring In*: Timer blocks accept input data to reset timer(s).
- *Wiring Out*: Timer blocks output elapsed or absolute time values (a long integer), to a connected block.

Time Stamp Block

Block Information

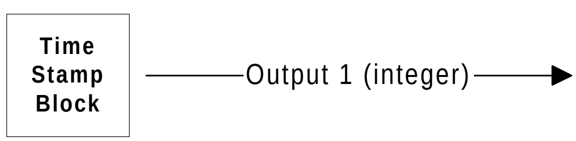


Figure 3-42: Time Stamp Block Information

- Number of inputs: 0
- Input type: none
- Number of outputs: 1
- Output type: string

Interface

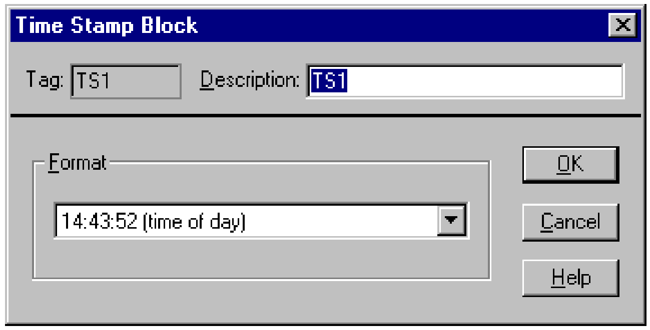


Figure 3-43: Time Stamp Block Configuration Dialog Box

Description

This block has output capability. The current time may be assigned to the display or to a log file by connecting this block's output to a log file or Numeric/string display item.

Different output formats are allowed, and these outputs are in the form of a string.

- *Wiring In*: No wiring input connection. "Cannot accept input" message will be displayed.
- *Wiring Out*: Time Stamp block outputs the current time to connected block(s). There are multiple time formats for selection.

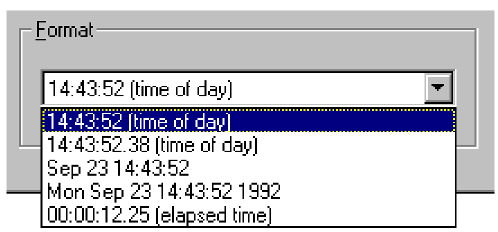


Figure 3-44: Time Stamp Output Format

Ramp Block

Block Information

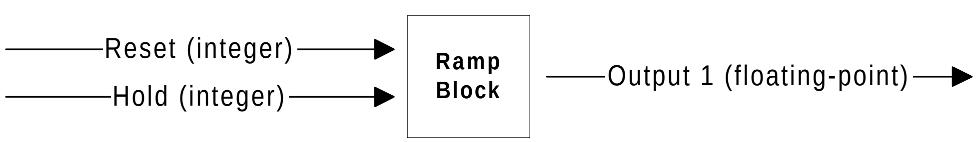


Figure 3-45: Ramp Block Information

- *Number of inputs*: 2 (reset, hold)
- *Input type*: integer, integer
- *Number of outputs*: 1
- *Output type*: float

Interface

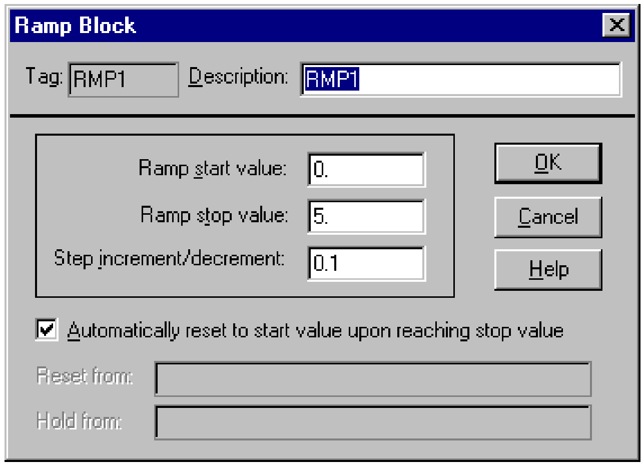


Figure 3-46: Ramp Block Configuration Dialog Box

- *Start Value*: A floating point value at which the ramp will start.
- *Stop Value*: A floating point value at which the ramp will finish. Can be above or below the Start value.
- *Increment/Decrement*: Each step up/down the ramp will be equal to this value.
- *Reset from Block*: Any digital type block used to apply a digital high/low to reset/start the ramp. A digital high applied to this input resets the ramp and stops ramping. A digital low allows ramping to occur. No reset input is treated as a low input.
- *Hold from Block*: Any digital type block used to hold the ramp at the current value. A high digital signal applied to this input stops ramping at the current value. A low applied to this input will enable/resume ramping. No hold input is treated as a low input.

Description

This block allows input and output. A ramp of floating point values may be generated by using this block. By connecting a high digital value to the reset input, the ramp can be reset to its starting value. By applying a high digital value to the hold input, the ramp may be temporarily held at the current value. The rate of increase/decrease of the ramp is proportional to the sample rate (scan task period) selected.

- *Wiring In*: Ramp blocks accept input data as Reset from or Hold from data and use the data in block configuration.
- *Wiring Out*: Ramp blocks output generated analog values to connected blocks.

Beep Block

Block Information

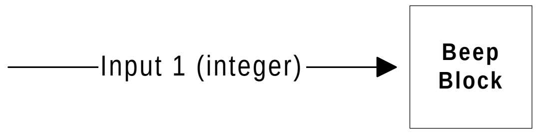


Figure 3-47: Beep Block Information

- *Number of inputs*: 1
- *Input type*: integer
- *Number of outputs*: 0
- *Output type*: none

Interface

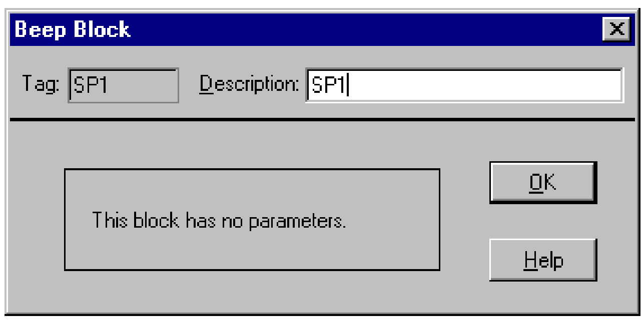


Figure 3-48: Beep Block Configuration Dialog Box

Description

This block accepts one input. It provides alarm output to the speaker in the PC or an external speaker. Digital blocks are used as input.

- *Wiring In:* Beep blocks accept digital input data to trigger sound alarms.
- *Wiring Out:* Beep blocks pass the input data to connected block(s).

Sound Block

Block Information

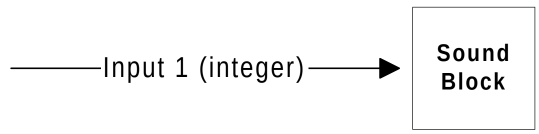


Figure 3-49: Sound Block Information

- *Number of inputs*: 1
- *Input type*: integer
- *Number of outputs*: 0
- *Output type*: none

Interface

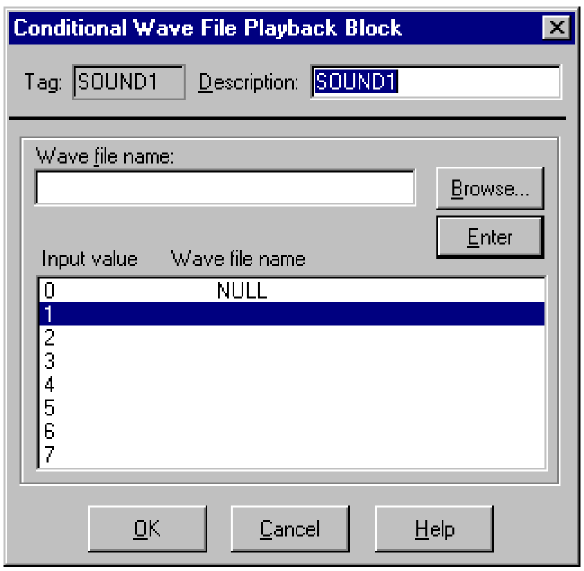


Figure 3-50: Conditional Wavefile Block Configuration Dialog Box

Description

This block has input capability. It accepts a value between zero (0) and seven (7) from another block, each value providing capability to select a wavefile to be played via a sound card during runtime. When this block is double clicked on, a dialog box will appear displaying all wavefiles currently installed.

- *Wavefile Name*: Specify the wavefile to be selected with the currently highlighted Input Value. Enter the full path, or Browse to locate the desired wavefile.
- *Wiring In*: This block accepts input values between zero (0) and seven (7) from another block, each

value providing capability to select a wavefile to be played via a sound card during runtime

- *Wiring Out*: No output available

Note: The current version of Advantech GeniDAQ CE does not support Sound Block.

System Control Block

Interface

- *Number of inputs*: 1
- *Input type*: integer
- *Number of outputs*: 0
- *Output type*: 0

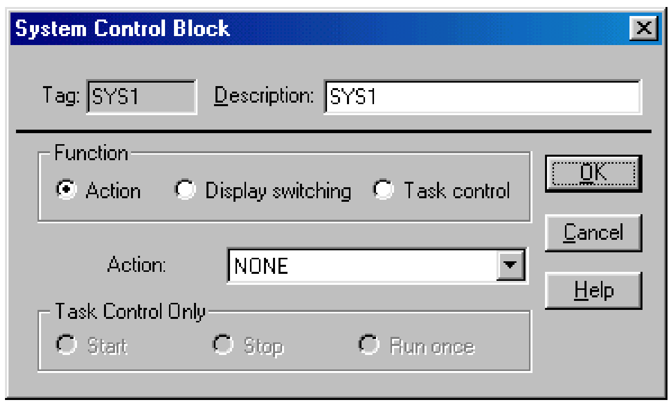


Figure 3-51: System Control Block Dialog Box

Description

This block has input capability. There are three functions provided by this block. One is to start/stop/pause/resume/lock/unlock/login/logout/close/exit system execution. Second is to switch between multiple display windows. Third is to start/stop/Run once system execution.

Field Description

- *Function*: You can set the System Control block to control system operation, task operation or to act as a display switch.
- *Action*: If you select *Action* mode, you can specify Start, Stop, Pause, Resume, Lock, Unlock, Login, Logout, Close, Exit or Refresh in this field. If you select *Display switching* mode, you must specify the window to switch. If you select *Task control* mode, you must specify the task to control.
- *Task Control Only*: If you select *Task control* mode in the *Function* field, you can specify Start/Stop/Run once in this field.

Note: You have to enable "Inactive" option in the Setup/Task Properties menu.

- *Wiring In*: System control block accepts data as trigger for the specified operation.

Summary

Task Designer uses a data flow programming model that frees you from the linear architecture of text-based languages. With GeniDAQ, you can learn and build a simple application within a few hours without worrying about the many syntactical details of conventional programming.

In addition to the intuitive programming model, GeniDAQ fully integrates BasicScript engine in its kernel to meet your specific needs. With BasicScript engine and the GeniDAQ environment, you can create code to execute BasicScript commands. It allows you to access and share data with other applications, such as Microsoft Access, Microsoft Excel, etc. In addition, you can also control GeniDAQ's operation, including task start/stop and display switching. It saves development and learning time. Please refer to *Chapter 10, Advanced BasicScript Programming for Your Specific Needs* for detailed information.

4

Configuring Your Display View With Display Designer

Overview

Display Designer provides an object-based development environment that you use to create your operator display panel. You can create a panel that is similar to test equipment or industrial process displays. You can also attach a bitmap background to customize your display. The operator display allows you to monitor, supervise, and control your process during runtime. When complete, the panel can use meters, bar graphs, waveform displays, chart recorders, buttons, numeric readouts, and LED indicators.

Advantech GeniDAQ provides multiple windows so you can view your process in different formats. You can divide the process into logical segments with summary screens showing the complete process, and other screens showing detailed parts of the process.

In addition, Advantech GeniDAQ also provide graphical tools to draw rectangles, circles, segments, and polygons. These objects or cells can be linked to a tag value. They can change color according to the tag value. They can also be grouped together to make a single object. You can use them to draw pumps, valves or other industrial symbols.

Contents

- Working with the display window
- Working with objects
- Working with display objects
- Working with control objects
- Working with cell objects
- Summary

Working with the Display Window

Advantech GeniDAQ allows you to create multiple displays. The number of displays depends on the system resources. You can switch to or toggle between the displays using the menu button object or BasicScript's *Display* command. When you create a new display window, you will be required to define certain properties for that window such as pop-up placement, default size, title bar icon and window button options. The elements of a display window are as shown below.

The elements of display windows include:

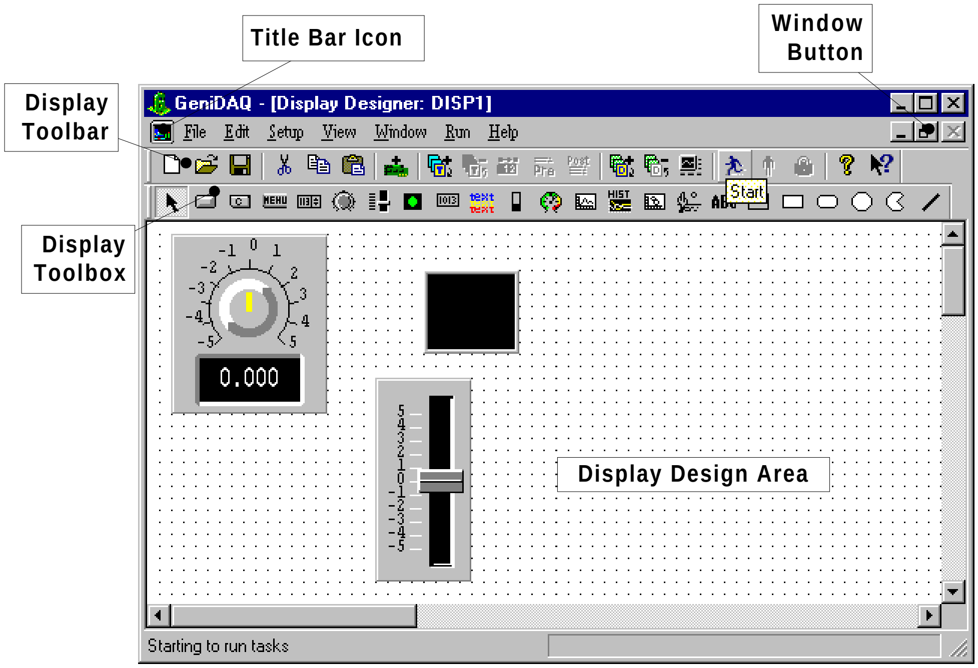


Figure 4-1: Display Designer Screen

Display Toolbox

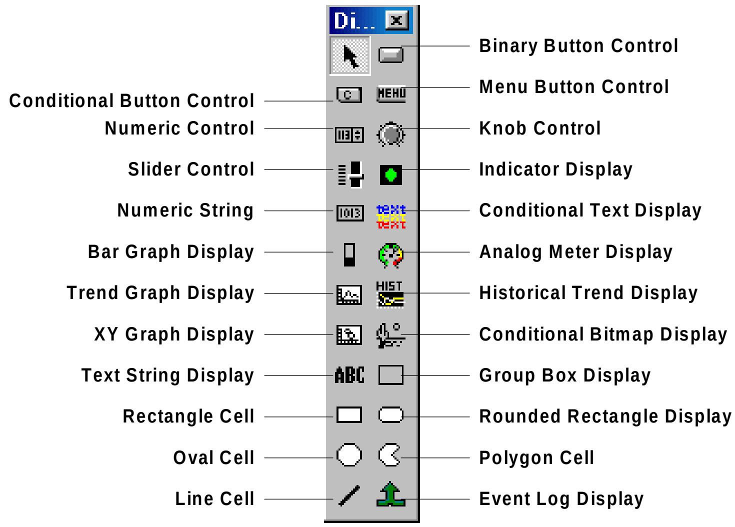


Figure 4-2: Display Designer's Design Toolbox

- For more information about the *Historical Trend Display*, refer to Chapter 6, *Historical Trending System*.

Creating and Configuring a Display

When you create a new strategy, GeniDAQ creates a display by default. You can create more displays by selecting **File | Add/Delete | Add Display** from the main menu or you can delete a display by switching to the display and selecting **File | Add/Delete | Delete Display** from the main menu.

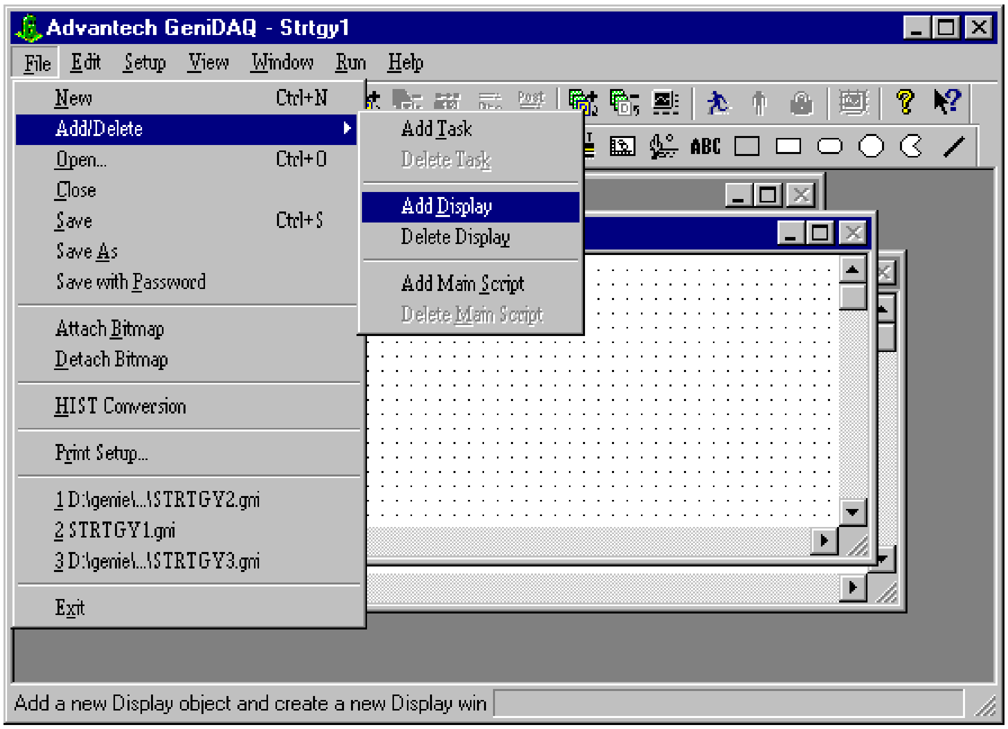


Figure 4-3: Adding and Deleting Displays

You can also add and delete displays by choosing the **Add Display** and **Delete Display** icons on the Display Designer's toolbar:

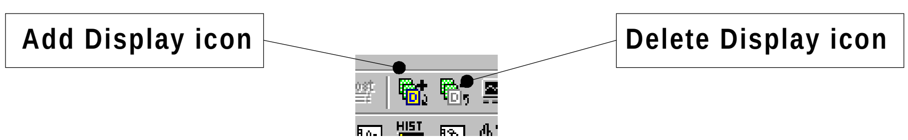


Figure 4-4: The Add Display **and** Delete Display **Toolbar Icons**

After you create a new display window, you should configure the runtime properties of the display windows. Switch to the display window and then click on the **Setup | Display Properties…** menu. A *Display Properties* configuration dialog box appears:

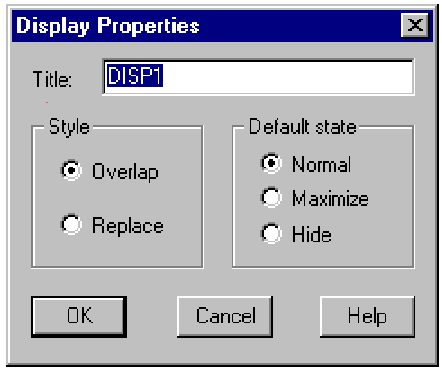


Figure 4-5: Display Properties Window

You can also open the *Display Properties* configuration window by clicking on the **Display Properties** toolbar icon:

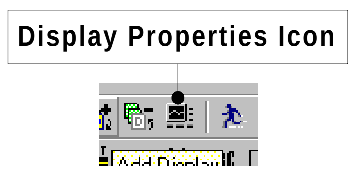


Figure 4-6: Display Properties Icon on the Task Designer Toolbar

Field Descriptions

- *Title*: Type the name of the display that you want to appear in the window's title bar.
- *Style*: Choose the style of the display window – either *Overlap* or *Replace*.
- *Default state*: Choose the default state of the window – either *Normal*, *Maximize* or *Hide*

Click **OK** to save your configuration changes or click **Cancel** to close the *Display Properties* dialog box without saving your changes.

Attaching/Detaching a Background Bitmap

You can import a bitmap file as a background picture for a display window. Switch to the display window and select **File | Attach Bitmap** from the main menu. The following dialog box appears. A standard Windows *Open* dialog appears to enable you to select a bitmap from your computer's drives.

To attach a background bitmap:

1. Select **File | Attach Bitmap** from the main menu.
2. A standard Windows *Open* dialog box loads. Select the bitmap that you want to add to your display and click the **Open** button.

Figure 4-7: Select the Bitmap to Attach

3. The bitmap will appear, aligned with the top-left corner of your display window.

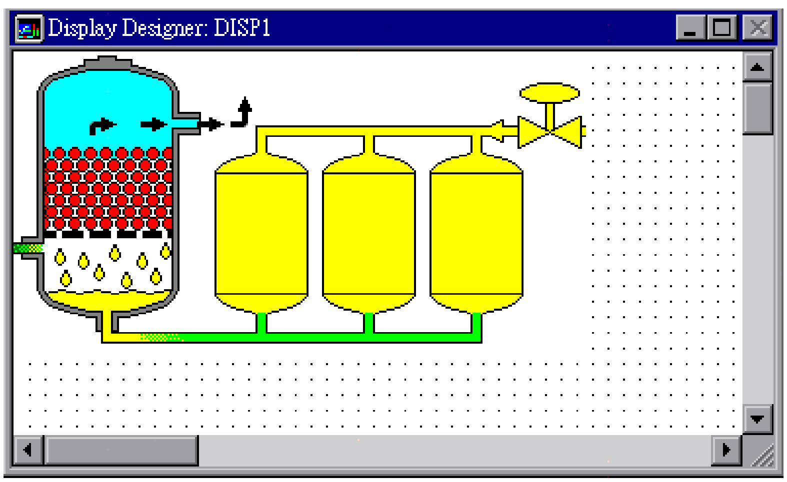


Figure 4-8: Attached Bitmap will Appear in Display Window

Note: *A previously attached bitmap picture can be removed by choosing **File | Detach Bitmap** from the main menu.*

Working with Objects

Once you have created a new display window in your strategy, you are ready to populate it with display objects, control objects and cell objects. GeniDAQ provides an intuitive environment for editing and arranging these graphic objects.

Populating a Display with Objects

To add an object to your display window:

1. The Display Designer toolbox should be visible at the top of your screen. If it is not showing, select **View | Toolbox** from the main menu and make sure it is checked.
2. Click the object in the toolbox that you want to add. The toolbox item will appear as selected and your cursor will change to appear as a cross-hair.
3. Click the Display Designer configuration area. The oject will be appear in the configuration area.

Selecting and Sizing Objects

When you click an object in your configuration area, several little boxes will surround it. These boxes are called “handles”. You use these handles to resize the object. Click and drag the handles until the object is the size and shape that you want. Handles on the corners of the object enable you to size the object in both horizontal and vertical directions, while clicking the handles on the sides of the object enable sizing in only one dimension.

Duplicating Objects

If you want to make a duplicate copy of an object that appears in the Display Designer window, select the object by clicking it. Select **Edit | Copy** from the main menu and then select **Edit | Paste**. A new object will appear in the window.

Cutting Objects

To cut objects and then paste them into other displays that you have created for the strategy, complete the following procedure:

1. Select the object that you want to cut in the Display Designer window.
2. Select **Edit | Cut** from the main menu.
3. Select **Window** on the main menu and then choose the display to which you want to paste the object.
4. Select **Edit | Paste** from the main menu.

Moving Objects

If you want to move an object that appears in the Display Designer window, select the object by clicking it. Use keyboard or mouse to move it. If you need finer tuning for arranging display items, click View | Grid menu to disable the grid function. These grid lines will be the bases of display item arrangement.

Arranging Objects

You can layer the objects in your window by positioning the objects in front or behind each other. Also you can use grid lines to arrange objects. For example, consider the following display that shows a conditional text display item overlapping another conditional text display item:

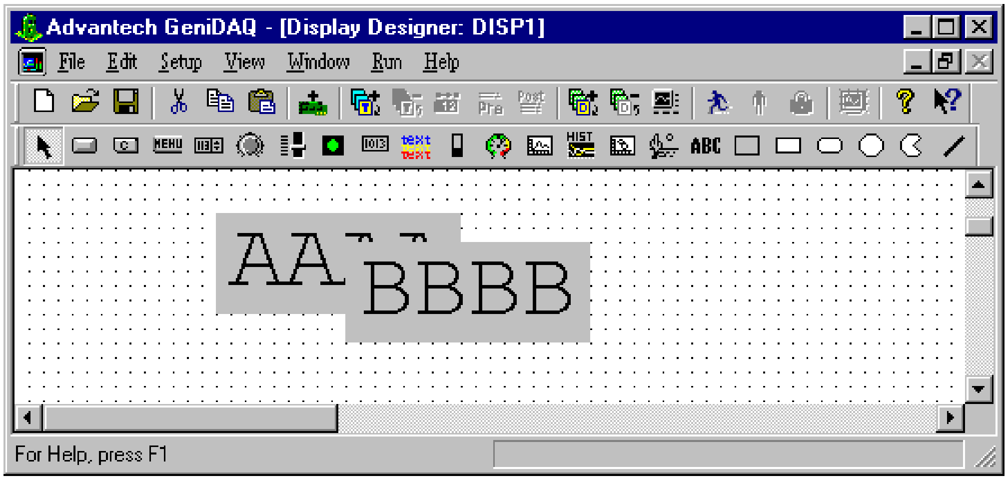


Figure 4-9: Example of Send to Back/Bring to Front

To change the z-order of two overlapping display items:

1. Select the object whose z-order you want to change.
2. Select **Edit | Bring to Front** from the main menu to make the selected object appear "on top" of the other objects. Select **Edit | Send to Back** to make the selected object appear "behind" the other objects.

The display will now appear as follows:

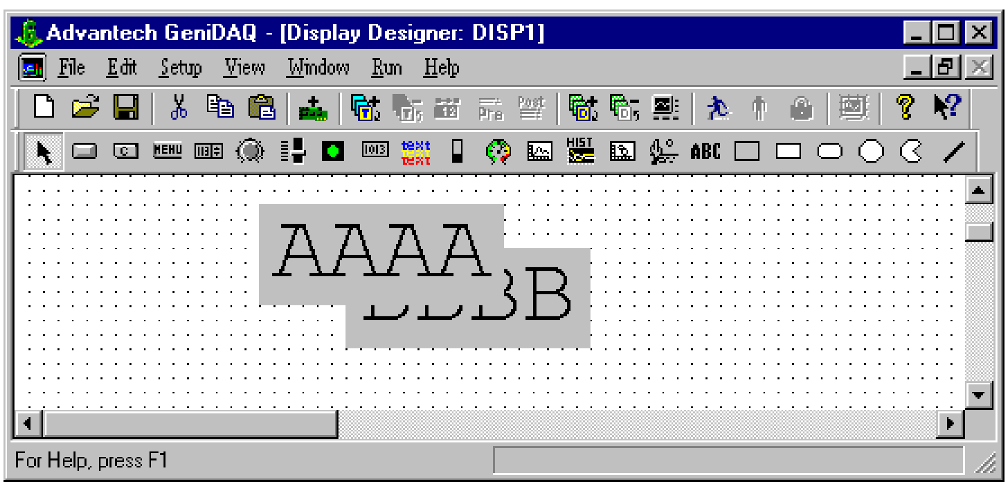


Figure 4-10: Example of Send to Back/Bring to Front

Working with Display Objects

The display objects are used to display data. They include

- Indicator display
- Numeric/String display
- Conditional Text display
- Bar Graph display
- Analog Meter display
- Trend Graph display
- XY Graph display
- Conditional Bitmap display
- Text String display
- Group Box display

General Guidelines for Using Display Objects

Display objects that are available for inclusion in your display appear on the display toolbar. To add a display object to your display, click the toolbar icon (it will appear as being selected) and then click the display area. The display object will appear in the display window at its default size. You can then drag the object's handles to resize it. Alternatively, you can click the display object and then drag a region in the display window where you want the display object to appear. Using this second method will size the object to your preference.

Once the display object is in the display window, you must configure its properties and choose its input source. Either double-click or right-click the display object and the display object's configuration dialog box will open.

Choosing Input for Display Objects

You must specify an input source for all display objects. This is normally from a task object that you have previously created in the Task Designer. The following example illustrates the configuration of an input source (from a Temperature Measurement object in the Task Designer) for the Analog Meter display. The process of configuring input sources for other display objects is the same.

To configure a display object's input source:

1. Switch to the *Task Designer* window by choosing **Window | Task Designer:TASK1** from the main menu.
2. Place a Temperature Measurement object on the Task Designer window.
3. Switch to the *Display Designer* window by choosing **Window | Display Designer:DISP1** from the main menu.
4. Place an Analog Meter display object on the Display Designer window. Right-click the object to open the *Analog Meter Display Object* configuration dialog box.
5. Click the **Select** button. The *Connection* configuration dialog opens that allows you to select the input source for the display object. The list boxes in the *Connection* dialog box will show you the available input sources in your system (see the following figure for more information):

- *Task/Display/Virtual*: Select the task or display name where the input is located.

- *TagName*: Select the tag name that provides the input source.
- *Channels*: Select the channels for the input source.

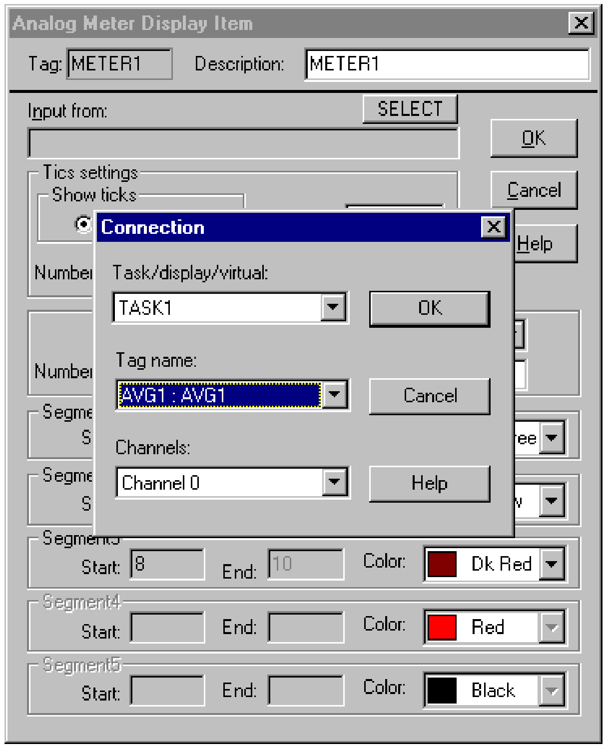


Figure 4-11: Connection Configuration Dialog Box

Indicator Display Item

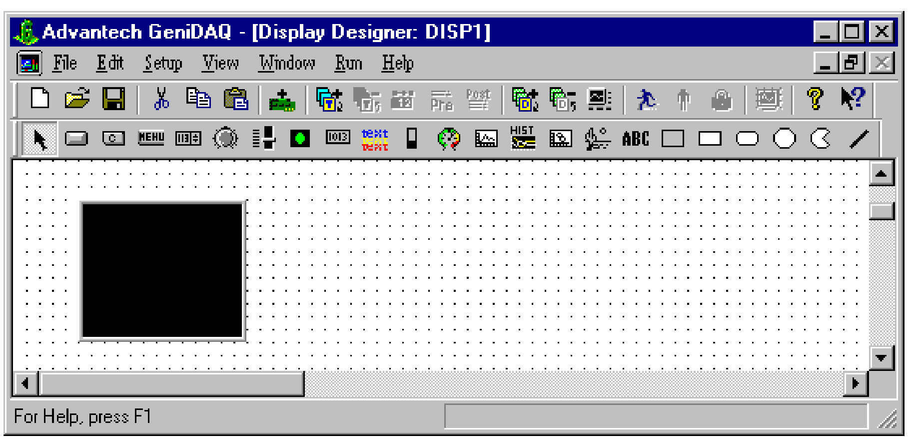


Figure 4-12: Indicator Display Item in Workspace Window

Description

An LED indicator, displaying the output state of a tagged digital block, may be simulated here by specifying a digital tag name from the Task variable. A digital 1 turns on the indicator and a 0 turns it off. The color and size of the indicator may be chosen.

Configuration Dialog Box

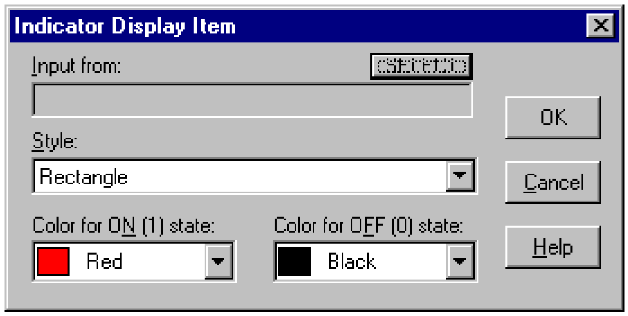


Figure 4-13: Indicator Display Item Configuration Dialog Box

Field Description

- *Input from*: The Indicator Display Item may be drawn and interfaced to a Task block variable with a certain tag name. When in associated configuration dialog box (double-click on the Indicator Display Item), you must first choose which Task block's data you would like to display. You can select the available icon blocks by pressing the select button and setting the appropriate task/display name, tag name and channel name. The tagged block's dynamic value is displayed during runtime.
- *Style*: This field is used to select the graph for indicator display. There are two kinds of graphs: Rectangle, Round or Ellipse.
- *Color for On/Off State*: This field is used to select the colors for On/Off value of indicator display. GeniDAQ provides 16 colors to choose from.

Numeric/String Display Item

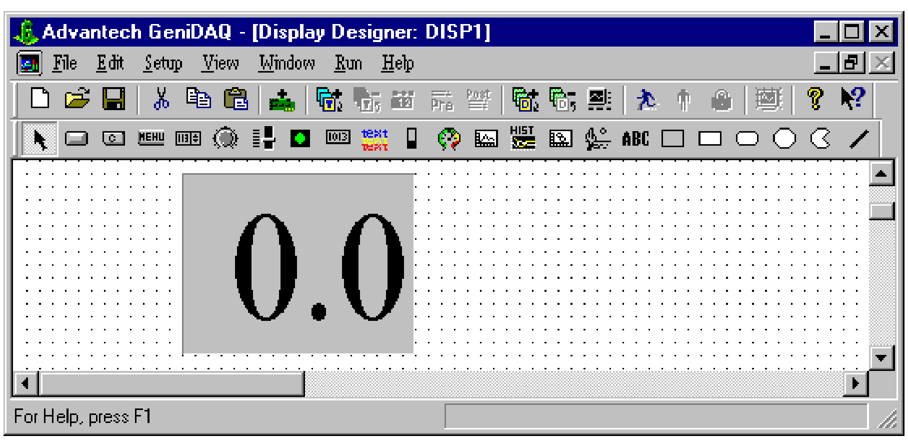


Figure 4-14: Numeric/String Display Item in Workspace Window

Description

The numeric display item displays output data from the Task block during runtime.

A numeric/string display may be drawn and interfaced with a Task block variable with a certain tag name. The size of the display may be chosen. The data format can be set as floating point (real), integer, or string. You can also set the display format, including the number of digits and location of the decimal point (for floating point format). In addition, you can choose the font, size and color of the numbers or text to be displayed. Justification is also possible.

Configuration Dialog Box

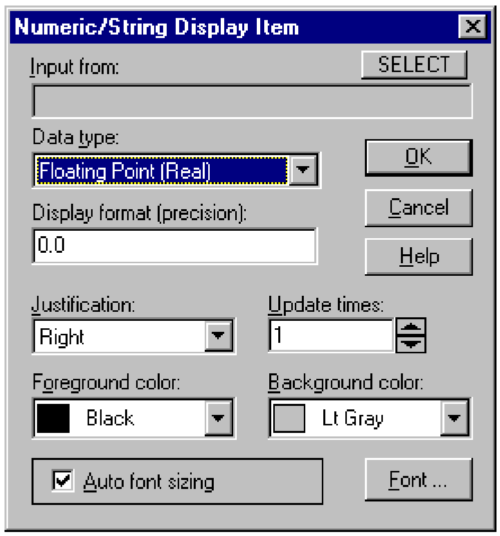


Figure 4-15: Numeric/String Display Item Configuration Dialog Box

Field Description

- *Input from*: The Numeric/String Display Item may be drawn and interfaced to a Task block variable with a certain tag name. When in associated configuration dialog box (double-click on the Numeric/String Display Item), you must first choose which Task block's data you would like to display. You can select the available icon blocks by pressing select button and setting the appropriate task/display name, tag name and channel name. The tagged block's dynamic value is displayed during runtime.
- *Data Type*: This field is used to select the data type of a display value. The type can be floating point (real), integer or string.
- *Display Format (precision)*: If you select the data type to be floating point or integer, then you can set the display format for output value. For example, set the format to be "0.00"
- *Justification*: You can use this setting to adjust the position of display output in the display field.
- *Foreground color/Background color*: This field is used to select the Foreground color/Background color of numeric/string value. GeniDAQ provides 16 colors to choose from.
- *Update rate*: The Update rate is a divisor that allows the Numeric/String Display block to have a different effective scan rate than the rest of the Task. This is useful if, for example, your Task is running at 100 Hz, but you only want to display data at a rate of 20 Hz. For this example, you would set the Update Rate to 5 (100 divided by 5 (the update rate) gives an effective scan rate of 20 Hz). For this example, only one in five samples would be displayed; the others would be ignored.

Conditional Text Display Item

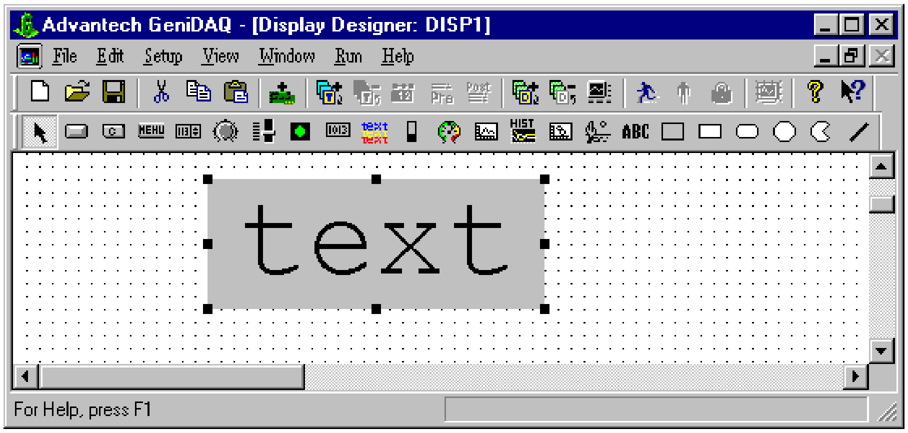


Figure 4-16: Conditional Text Display Item in Workspace Window

Description

This display item has input and output capability. It accepts a value between zero (0) and seven (7) from a Task block, each value providing capability to select text to be displayed. In addition, the string may be output to a block accepting a string as input, such as to the RS-232 block. When this display item is double-clicked upon, a dialog box will appear displaying all text currently installed.

Configuration Dialog Box

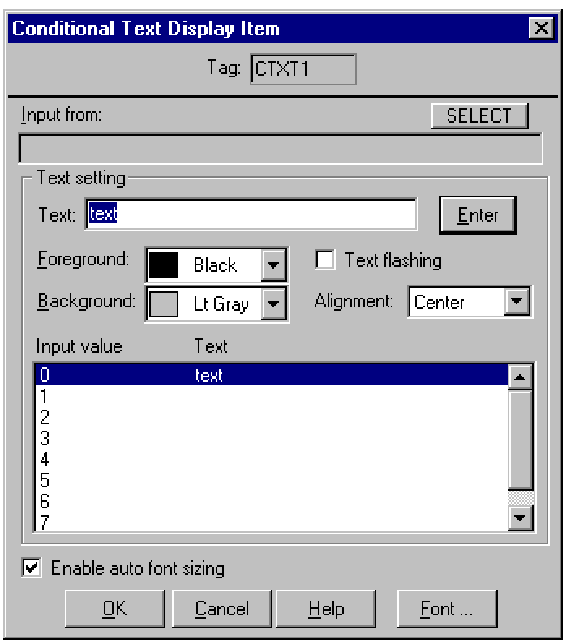


Figure 4-17: Conditional Text Display Item Configuration Dialog Box

Field Description

- *Text*: Specify the Text file to be selected corresponding with the currently highlighted Input Value.
- *Foreground/Background color*: Specify the Text and Background color for the currently highlighted Input Value.
- *Alignment*: Specify the Text Alignment for the currently highlighted Input Value.

Bar Graph Display Item

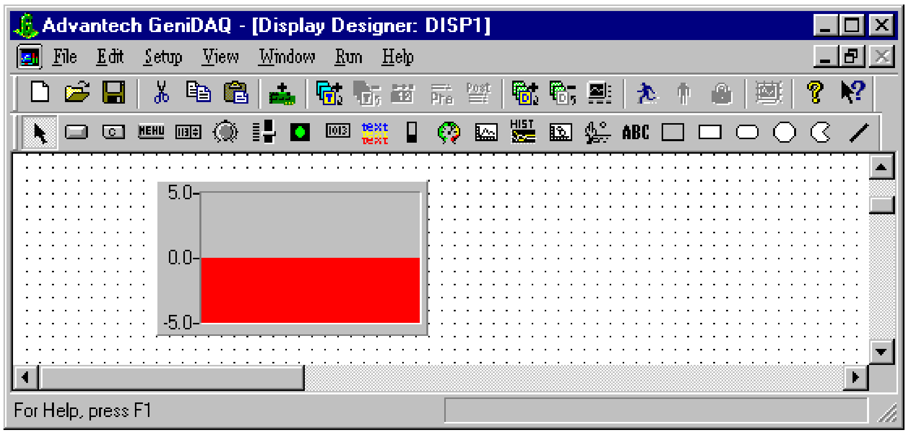


Figure 4-18: Bar Graph Display Item in Workspace Window

Description

The Bar graph display item allows you to view output data from the task designer icon block during runtime.

Configuration Dialog Box

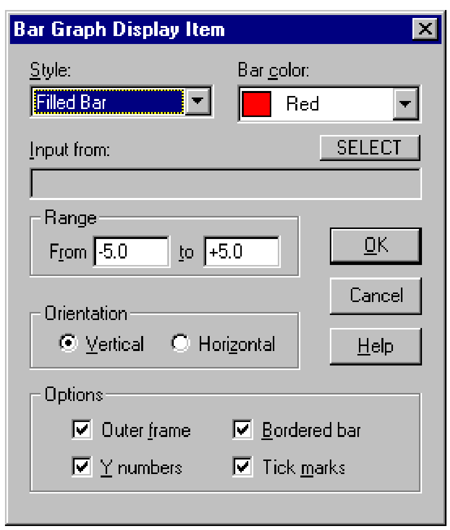


Figure 4-19: Bar Graph Display Item

Field Description

- *Input from*: The bar graph may be drawn and interfaced to a Task Block variable with a certain tag name. The color and size of the bar graph may be chosen. When in associated configuration dialog box (double-click on the bar graph), you must first choose which Task Designer block's data you would like to display. You can select the available icon blocks by pressing select button and setting the appropriate task/display name, tag name and channel name. The tagged block's dynamic value is displayed during runtime.

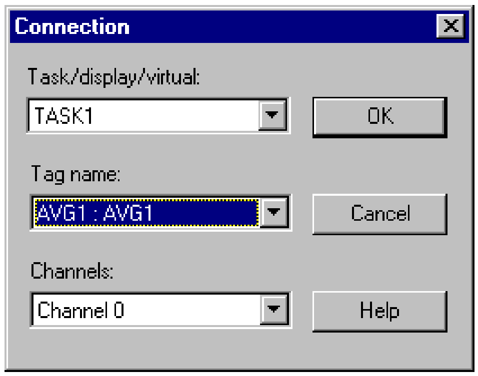


Figure 4-20: Connect Bar Graph display with Task

You can choose the bar's color, the range, the orientation (vertical or horizontal), and the style of the bar graph. The style section is a series of check boxes allowing you to choose whether you see an outer frame, bordered bar, or whether or not you want numbers or tick marks to be displayed.

- *Style***:** This field is used to specify the graph style as filled bar or moving mark.
- *Bar Color***:** This field is used to specify the color of graph. There are 16 colors provided in GeniDAQ.
- *Range***:** This field is used to specify the value range that is displayed by the bar graph.
- *Orientation***:** This field is used to specify the orientation of bar graph motion. That is, you can set the bar graph to move either vertically or horizontally.
- *Options***:** This field is to enable/disable the display of outer frame, boarded bar, Y numbers and tick marks on the bar graph.

Analog Meter Display Object

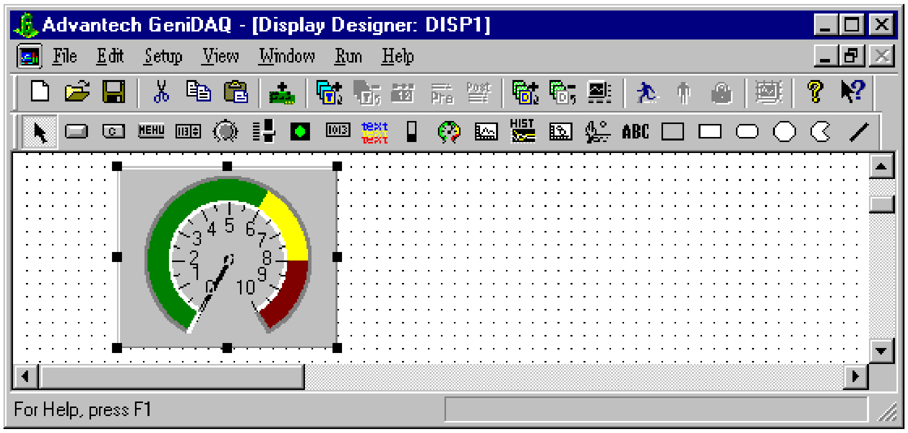


Figure 4-21: Analog Meter Display Object in Workspace Window

Description

The Analog Meter display object displays output data from the Task block during runtime in the form of an analog meter. The Analog Meter may be drawn and interfaced to a Task block variable with a certain tag name. The number, color and size of the color segments may be chosen. When in the associated configuration dialog box (double-click on the Analog Meter), you must first choose which Task block's data you would like to display.

Available icon blocks are displayed in a list box labeled "Input from". The tagged block's dynamic value is displayed during runtime. You can choose the segment color, range, orientation (vertical or horizontal), and the initial Analog Meter value. Up to five segments can be specified. The style section is a series of check boxes allowing you to choose whether you see an outer frame, bordered bar, or whether or not you want numbers or tick marks to be displayed.

Configuration Dialog Box

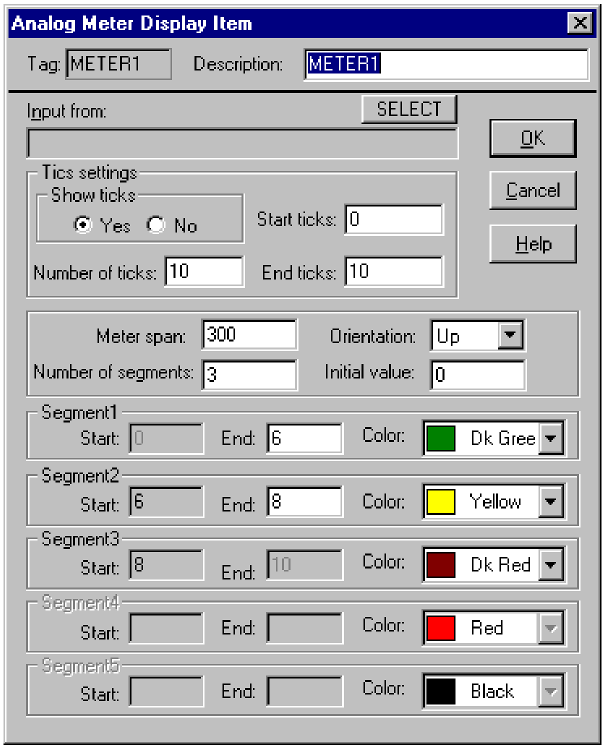


Figure 4-22: Analog Meter Display Object Configuration Dialog Box

Field Description

- *Show Ticks*: Specify whether Ticks will be displayed.
- *Start Ticks*: Specify the Ticks start number.
- *End Ticks*: Specify the Ticks ending number.
- *Number of Ticks*: Specify how many total Ticks
- *Meter Span*: Specify the total numeric span of the meter.
- *Orientation*: Specify the meter orientation (Up, Down, Right, or Left).
- *Initial Value*: Specify the value to which the meter needle will point upon Runtime Startup.
- *Number Of Segments*: Specify the total number of color segments (up to five) for the span of the meter.
- *Segment 1-5 Start, End, and Color*: For each enabled meter segment, specify the numeric start, end, and color of the meter segment.

Trend Graph Display Item

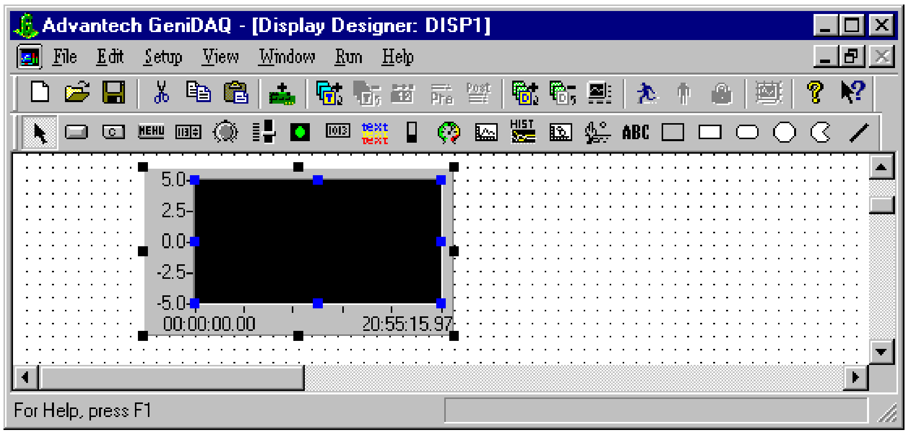


Figure 4-23: Trend Graph Display Item in Configuration Window

Description

A Trend Graph may be drawn and interfaced with one or many Task Block variable(s) with a certain tag name or names. The color and size of the graph may be chosen. It can display data from any number of Task Blocks on the Y-axis, against time on the X-axis. It can also display data from two Task Blocks on its axes.

The Update rate is a divisor that allows the Trend Graph Display item to have a different effective scan rate than the rest of the Task. This is useful if, for example, your Task is running at 100 Hz, but you only want to display data at a rate of 20 Hz. For this example, you would set the Update Rate to 5 (100 divided by 5 (the update rate) gives an effective scan rate of 20 Hz). For this example, only one in five samples would be displayed; the others would be ignored. Using the update rate option in this way will alleviate a flickering effect when using a very fast scan rate.

The Trend graph allows you to plot data from two separate blocks against each other. The colors of the trace and background can be chosen, as well as the length of the trace. Using a trace with a smaller number of points will use less machine memory, and your display will run much more efficiently.

The graph style can be selected, giving you flexibility in your display, allowing you to show ticks and/or numbers on the axes. In addition, ranges for both axes can be selected. This permits you to make your display any size or scale.

Note: *Keep in mind that when using an X-axis with a large scale (i.e. long time spans), and especially if you are displaying more than one trace, memory requirements are increased. All data points that are displayed must reside in memory; the more data points you display, the more memory you will need.*

Configuration Dialog Box

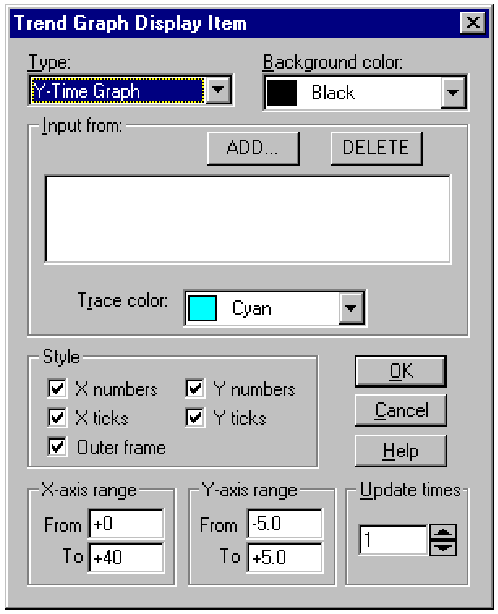


Figure 4-24: Trend Graph Display Item Configuration Dialog Box

Field Description

- *Type*: Select the kind of trend graph that you want to use in your display
- *YT Trend Graph*: For the YT Trend graph, you can choose the colors and the ranges that will be displayed. You next need to choose which Strategy Editor block's data you would like to display, corresponding with your chosen trace colors. Available icon blocks are displayed in a list box labeled "Input Blocks". Any number of blocks can be interfaced for display in one graph (however, eight seems to be the practical limit). By double clicking on each desired icon block tagname, tagnames are selected for graphical display. When blocks are selected, an asterisk appears to the left of the tagname. As you select tagnames for display, you can choose separate trace colors for each tagname. The color for a trace is displayed and can be changed each time a selected tagname is highlighted with the mouse. You can also change the style of your graph. The style section is a series of check boxes displaying available options.
- *Background Color*: Select the background color
- *Input from*: Select the data source
- *Trace Color*: Select the color of the data line
- *Style*: Select the optiosn that you want to use the customize the appearance of your trend graph display
- *Range of x axis*: Enter the maximum and minimum values for the x (i.e., horizontal) axis
- *Range of y axis*: Enter the maximum and minimum values for the y (i.e., vertical) axis
- *Update Rate*: Enter the update rate (in seconds)

XY Graph Display Item

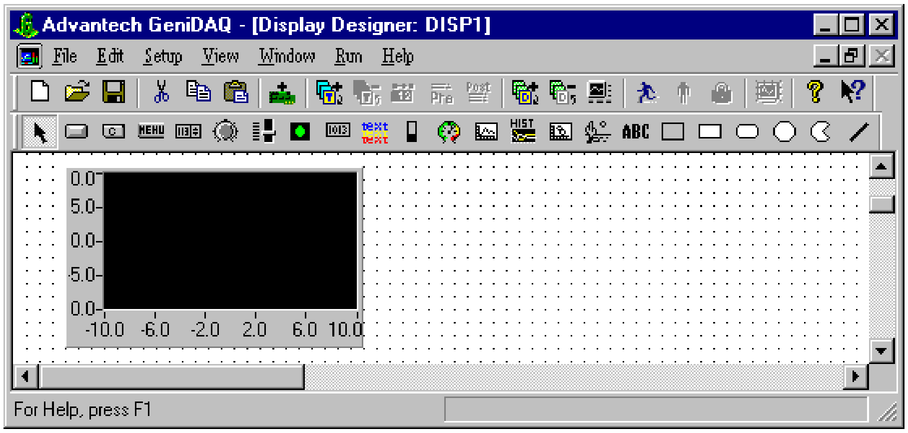


Figure 4-25: XY Graph Display Item in Workspace Window

Description

The XY graph allows you to plot data from two separate blocks against each other. The colors of the trace and background can be chosen, as well as the length of the trace. Using a trace with a smaller number of points will use less machine memory, and your display will run much more efficiently. The XY Graph displays data from two Strategy Blocks on its axes.

Configuration Dialog Box

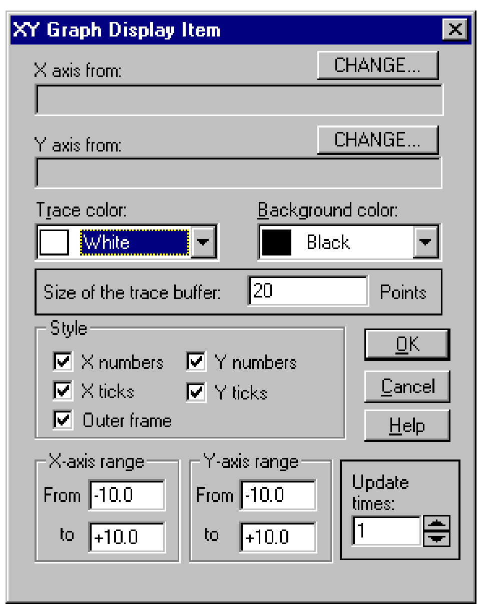


Figure 4-26: Trend Graph Display Item Configuration Dialog Box

Field

- *X/Y axis from*: The XY graph allows you to plot data from two separate blocks against each other. You can change the input data using the CHANGE button.
- *Trace/Background color*: This field is used to specify the color of trace and background for a given XY display.
- *Size of the Trace Buffer*: This field is used to specify the size of the trace buffer for a given XY display.

Note: *Keep in mind that when using an X-axis with a large scale (i.e. long time spans), and especially if you are displaying more than one trace, memory requirements are increased. All data points that are displayed must reside in memory; the more data points you display, the more memory you will need.*

- *Style*: This field is used to enable/disable several display items in an XY or YT Graph Display chart, including X numbers, Y numbers, X ticks, Y ticks and outer frame.
- *Range of X/Y axis*: These fields are used to specify the maximum and minimum value ranges of X and Y display data.
- *Update rate*: The Update rate is a divisor that allows the Numeric/String Display block to have a different effective scan rate than the rest of the Task. This is useful if, for example, your Task is running at 100 Hz, but you only want to display data at a rate of 20 Hz. For this example, you would set the Update Rate to 5 (100 divided by 5 (the update rate) gives an effective scan rate of 20 Hz). For this example, only one in five samples would be displayed; others would be ignored.

Conditional Bitmap Display Item

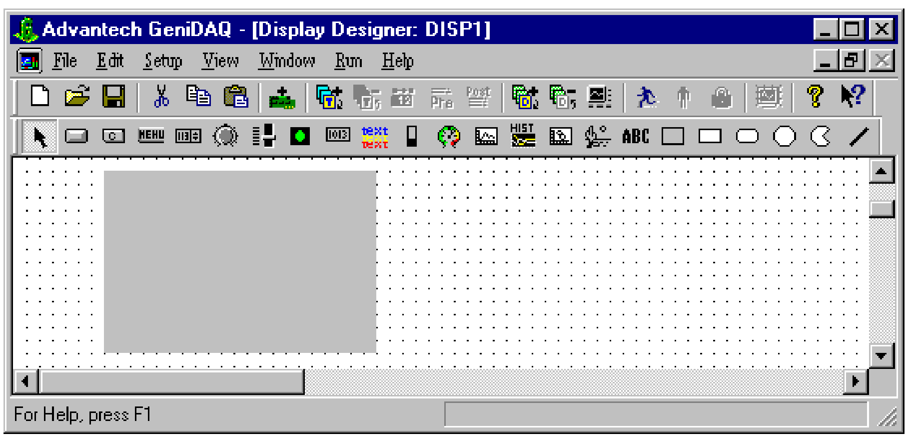


Figure 4-27: Conditional Bitmap Display Item in Workspace Window

Description

This display item has input capability. It accepts a value between zero (0) and seven (7) from a Task block, each value providing capability to select a bitmap file to be displayed during Runtime. When this display item is double-clicked upon, a dialog box will appear displaying all bitmaps currently installed.

Configuration Dialog Box

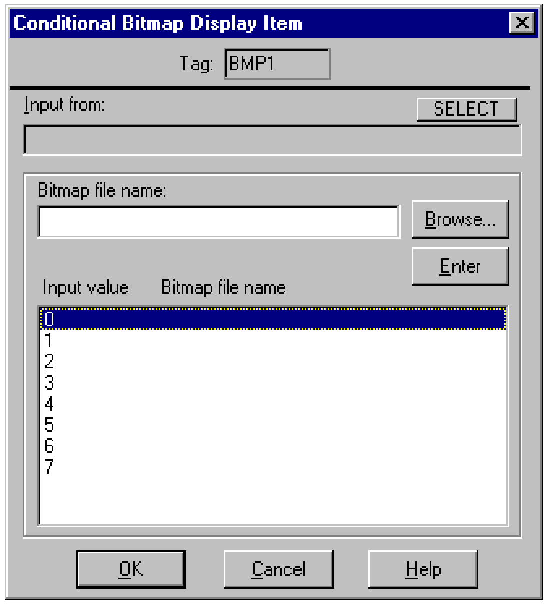


Figure 4-28: Conditional Bitmap Item Configuration Dialog Box

Field Description

- *Bitmap File Name*: Specify the bitmap file to be selected corresponding with the currently highlighted Input Value. Enter the full path, or Browse to locate the desired Bitmap file. For setting corresponding the bitmap filename, you have to select the related input value and select bitmap file, then press the ENTER button to configure it.

Text String Display Item

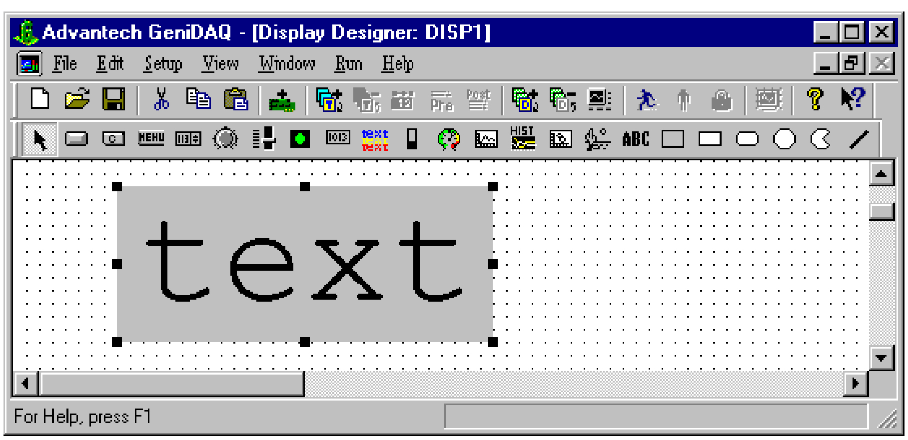


Figure 4-29: Text String Display Item in Workspace Window

Description

A text string label may be entered for display purposes only. No interface to Task blocks is provided. Within the Text String Display Item, you can choose the font, color and size of the displayed text by pressing the Font... button in the Text String Display Item dialog box.

Configuration Dialog Box

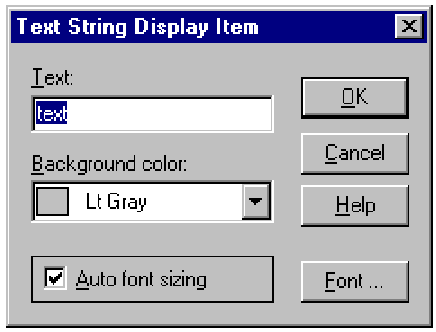


Figure 4-30: Text String Display Item Configuration Window

Field Description

- *Text*: This field is used to input desired text for display.
- *Background Color*: This field is used to specify the background color of this text field. If you want to specify the text color, you can assign it by disabling Auto Font Sizing and selecting the **Font...** button.

Group Box Display Item

Description

The group box display item is used to group together display objects.

Configuration Dialog Box

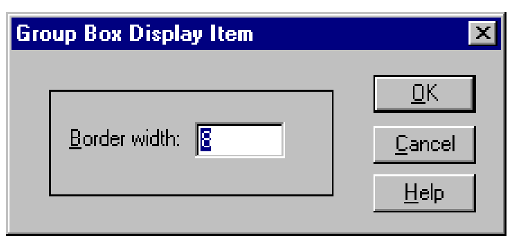


Figure 4-31: Group Box Display Item Configuration Dialog Box

Field Description

- *Border Width*: Specify the width of the group box when displayed in the Display Designer window.

Event Log Display Item

Interface

- *Number of inputs*: 0
- *Input type*: none
- *Number of outputs*: 0
- *Output type*: none

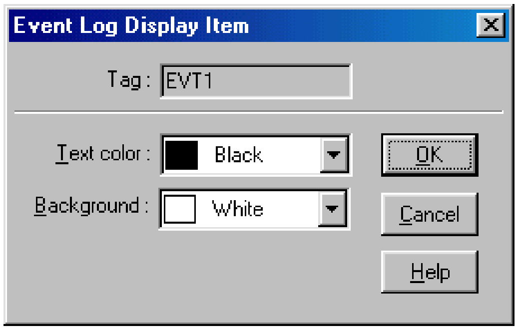


Figure 4-32: Event Log Display Item Dialog Box

Description

The *Event Log Display Item* is used to show all alarms and events. It should be used with the Alarm Log block and enable the *Event Log* option in **Setup | Runtime Preference** menu. Refer to the Alarm Log Block section. You can double-click on any alarm entry to acknowledge the message. The message's color will change from red to black and an acknowledgement message will appear in the window.

Field Description

- *Text color*: Set the text color
- *Backgound color*: Set the background color

Working with Control Objects

Control objects are used to supervise or control your process. The objects include

- Binary button control
- Conditional button control
- Menu button control
- Numeric control
- Knob control
- Slider control

Connecting a Control Object to a Task Block

You can connect a control object to a block in a task window through a tag block. For example, you can use a binary button control to open or close a valve through a digital output block. Alternatively, you can use a knob to control an analog output value. The following example shows a Binary Button control object being connected to a Rectangle Drawing block:

To connect a control object to a task block:

1. Place a Binary Button control object on the Display Designer window and a Task Block on the Task Designer window
2. Switch to the *Task Designer* window. Right-click the Tag Block.
3. The *Tag Block* configuration dialog box opens. In the *Display/Virtual Tag* combo box, select the display that controls the binary button. Select *BBTN1* in the *Tag Name* combo box.

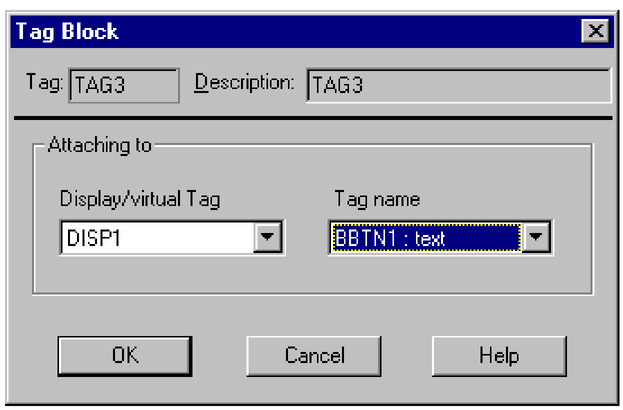


Figure 4-33: Connecting a Control Object to a Task Block

Connecting a Control Object to a Display Block

You can connect a control object to a display block.

Restore the Previous Stop Value

For control objects, GeniDAQ provide a “Restore the previous stop value” function. This function is used to save the values of control objects when the system stops. These values will then be restored when the system restarts. This function is included in the Binary Button, Conditional Button, Numeric, Knob and Slider controls.

Privilege Levels

In order to avoid unintentional or unauthorized operations which may affect system stability, GeniDAQ System Administration provides privilege control and password protection. Password protection offers built-in log-on with up to 255 levels of assignable access, providing extensive control for password access and conditional operations. To learn more about privilege level protection, please refer to *Chapter 9, Runtime and Security System* chapter.

Binary Button Control Display Item

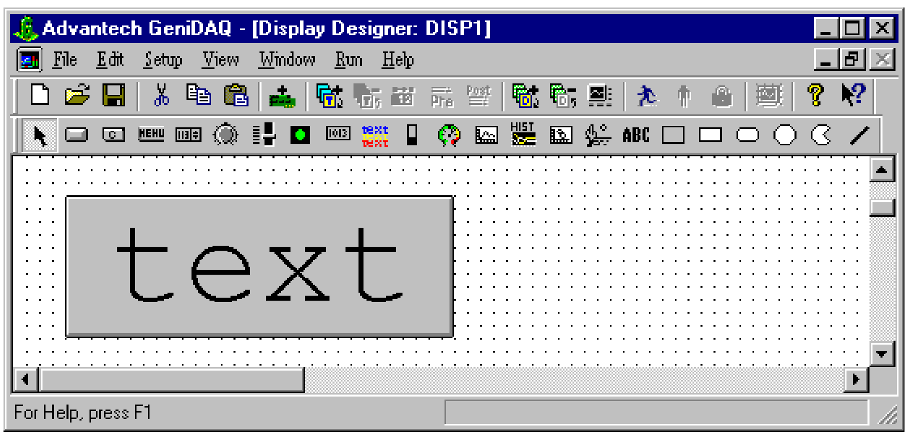


Figure 4-34: Binary Button Control Display Item in Workspace Window

Description

A binary button control display may be drawn and interfaced to a Task Block variable with a certain tag name. The size of the display may be chosen. This display item is an output from the display. The button is pressed by use of the mouse, and a digital 1 or 0 is sent to the tagged digital Task Block. The Button Display may also be toggled by use of the ENTER key, if the focus is currently on the Button. (The “focus”, a standard Windows term, refers to the display item which can currently be controlled by the keyboard). Focus may be shifted from one display item to another using the TAB key. In addition, a “hot key” may be specified to activate the button without changing the focus. This is done by changing the Keyboard Mapping parameter in the dialog box. Using control buttons, Supervisory Control can be achieved.

The size and properties of the font used in the button text can be changed in this block by pressing the **Font...** button in the Binary Button Display Item dialog box.

Configuration Dialog Box

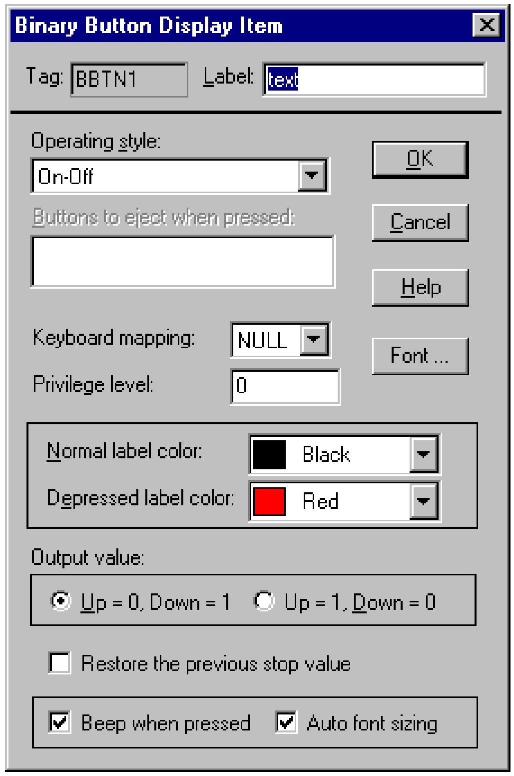


Figure 4-35: Binary Button Display Item Configuration Dialog Box

Field Description

- *Tag*: This field is used to specify the tag name of the binary button control display item. The tag name is used to represent the output value of this button. If you want to access this button value, you can configure a TAG in task designer to link with display number and tag name and this button value will be available for other blocks in task designer.
- *Label*: This field is used to specify the meaning of the button. The label will be displayed at the front of the button. You can change it using any alphanumeric characters. The maximum number of characters is 30.
- *Operating Style*: This field is used to specify the operating style of binary button to be On-Off, momentary or radio button. For On-Off style, the button will act as a switch to turn on or turn off and output digital 1 or 0 (based on the output value field setting). For Momentary style, the button will act as a pulse; that is it will return to depressed status immediately after the button is pressed. The button will output a down value and an up value immediately (based on the output value field setting). For Radio Button style, the button will be exclusive from other binary buttons. If the button is pressed down, other related buttons will come back up. In this style, you have to configure the related buttons by double clicking buttons in the “Buttons to eject when pressed” field. A start character will pop up at the front of related buttons. The output values of Radio Button style are the same as the On-Off style.

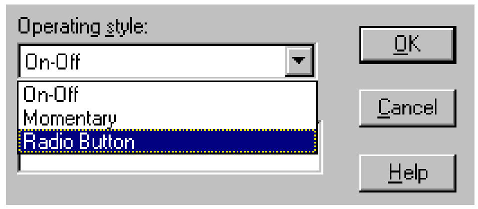


Figure 4-36: Configure Operating Style to be Radio Button

- *Keyboard mapping*: This field is used to set up the linkage between buttons and keywords. You can configure function key ('F2' to 'F8') or alphabetic character ('A' to 'Z') as a shortcut key for this button.
- *Privilege level*: This field is used for protection of system control. The privilege level is from 0 to 255, with larger numbers having the higher privilege. For example, if the privilege level of a button is 100, then the user's privilege must be larger than or equal to 100 to press this button.
- *Label Color*: This field is used to select the normal label color and the depressed label color of the button. VisiDAQ provides 16 colors from which to select.
- *Output value*: This field is used to configure the output value of a button. There are two output modes for your selection. You can select "Up = 0 and Down = 1" or "Up = 1 and Down = 0".
- *Options*: You can enable/disable these option fields as you want.
- *Restore the previous stop value*: This field is used to save the value of the control display at system stop. This value will be restored at the next system start.

Conditional Button Control Display Item

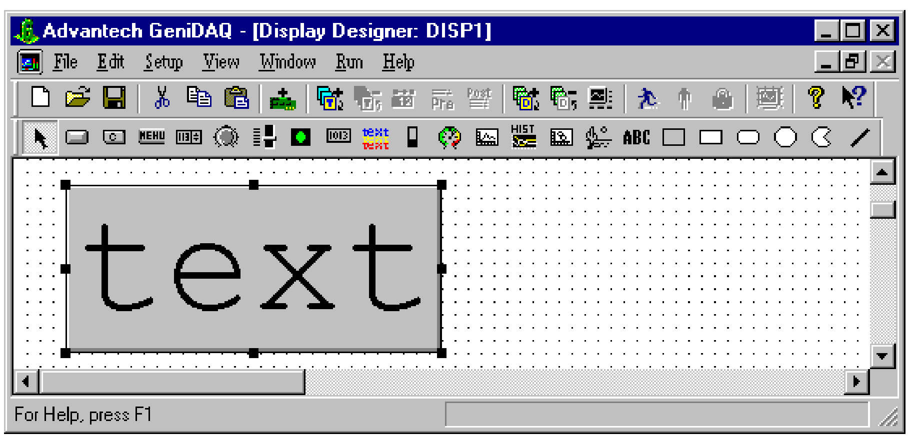


Figure 4-37: Conditional Button Control Display Item in Workspace Window

Description

The Conditional Button Display Item has both input and output capability. The output may be interfaced to a Task Block variable with a certain tag name. The button is pressed by use of the mouse, and a digital 1 or 0 is sent to the tagged digital Task Block. The Conditional Button Display may also be toggled by use of the ENTER key, if the focus is currently on the Conditional Button. The "focus", a standard Windows term, refers to which display item currently can be controlled by the keyboard. Focus may be shifted from one display item to another using the TAB key. Using conditional buttons, Supervisory Control may be achieved. The input may be interfaced to a Task Block variable with a certain tag name and is used for controlling the button's status from the Task (by sending a digital 1 or 0) instead of with the mouse. The size of the display may be re-sized with the mouse.

The size and properties of the font used in the button text can be changed in this block by pressing the **Font...** button in the *Conditional Button Display Item* dialog box.

Configuration Dialog Box

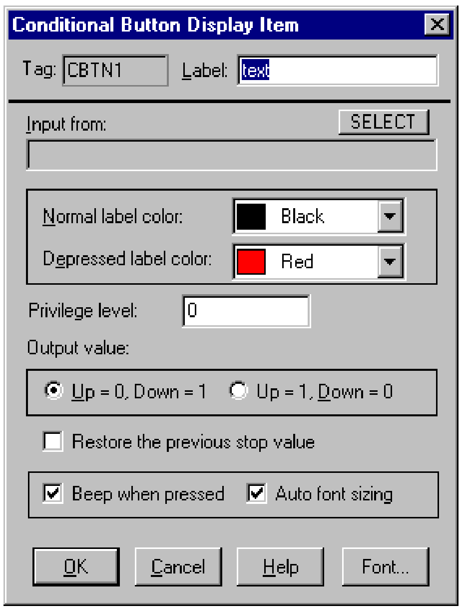


Figure 4-38: Conditional Button Control Configuration Dialog Box

Field Description

- *Tag*: This field is used to specify the tag name of the binary button control display item. The tag name is used to represent the output value of this button. If you want to access this button value, you can configure a TAG in task designer to link with display number and tag name and this button value will be available for other blocks in task designer.
- *Label*: This field is used to specify the meaning of the button. The label will be displayed at the front of the button. You can change it using any alphanumeric characters. The maximum number of characters is 30.
- *Input from*: The Conditional Button Display Item may be drawn and interfaced to a Task Block variable with a certain tag name. When in associated configuration dialog box (double-click on the Conditional Button Display Item), you must first choose which Task block's data you would like to display. You can select the available icon blocks by pressing select button and setting the appropriate task/display name, tag name and channel name. The tagged block's dynamic value is displayed during runtime.
- *Label Color*: This field is used to select the normal label color and the depressed label color of the button. GeniDAQ provides 16 colors from which to select.

- *Privilege level*: This field is used for protection of system control. The privilege level is from 0 to 255, with larger numbers having the higher privilege. For example, if the privilege level of a button is 100, then the user's privilege must be larger than or equal to 100 to press this button.
- *Output value*: This field is used to configure the output value of a button. There are two output modes for your selection. You can select "Up = 0 and Down = 1" or "Up = 1 and Down = 0".
- *Options*: You can enable/disable these option fields as you want.
- *Restore the previous stop value*: This field is used to save the value of the control display at system stop, and the value will be restored at next system start.

Menu Button Control Display Item

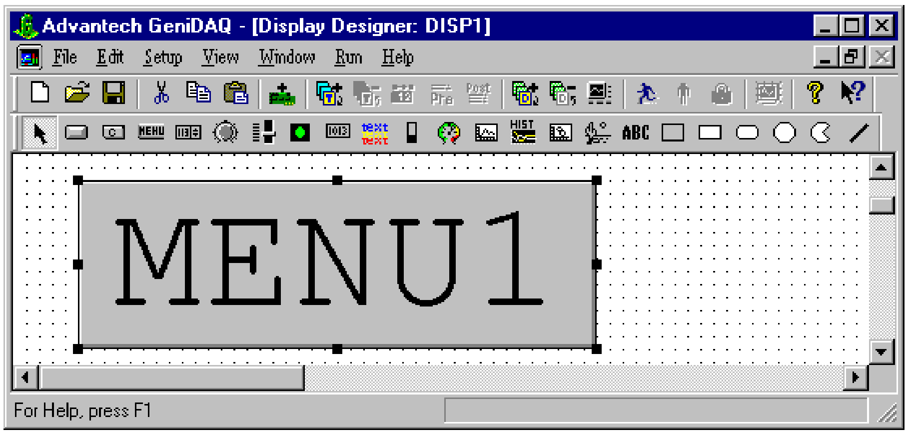


Figure 4-39: Menu Button Control Display Item in Workspace Window

Description

This menu item is used while the system is in Runtime mode. There are two functions provided by this menu button. One is to start/stop/halt/resume system execution. Another is to switch between multiple display windows.

Configuration Dialog Box

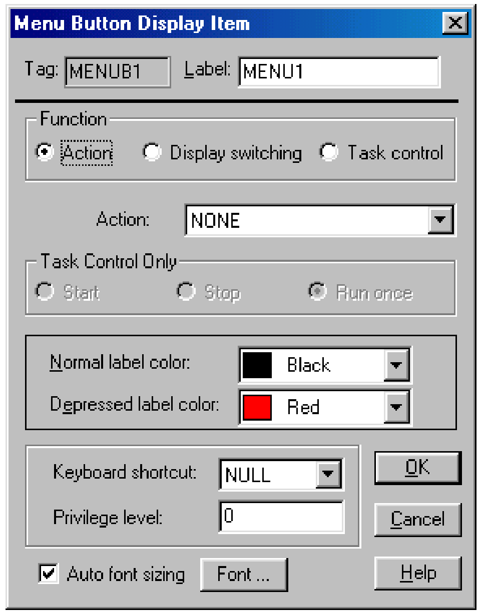


Figure 4-40: Menu Button Display Item

Field Description

- *Function*: You can set the menu button to act as a display switch or to control system/task operation. If you select 'Action' mode, you can stop, pause, resume, close, lock or exit system operation while in Runtime mode. In the 'Action' mode, you can also refresh the display.

  If you select 'Display switching' mode, you can specify display window names (for example, "DISP1") in this field and use this button to switch between displays while in Runtime.

  For "Task Control" mode, you can specify Start/Stop/Run once. Note that you should first enable the "Inactive" mode in Setup/Task Properties menu before you can apply the "Task Control" mode.

Numeric Control

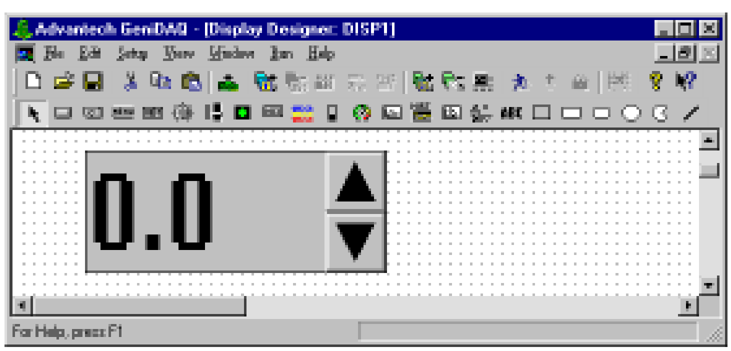


Figure 4-41: Numeric Control Display Item in Configuration Window

Description

A numeric-type control may be drawn and interfaced to control a Task block variable with a certain tag name. The size of the display may be chosen. This display item is used as an output from the keyboard or mouse; data is to be sent to a Task block variable by an operator who specifies the data. Using this method, Supervisory Control may be achieved. The data format can be set to integer or real. The display format (how many digits and the location of the decimal point) can be set for floating point format only.

The size and properties of the font used in this block can be changed by pressing the Font... button in the Numeric Control Display Item dialog box.

Configuration Dialog Box

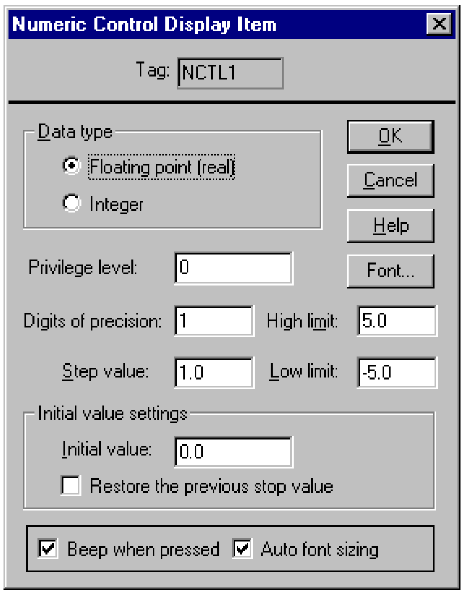


Figure 4-42: Numeric Control Display Item Configuration Dialog Box

Field Description

- *Data Type*: This field is used to select the data type of a display value. The type can be floating point (real), integer.
- *Privilege level*: This field is used for protection of system control. The privilege level is from 0 to 255, where the larger number has the higher privilege. For example, if the privilege level of a button is 100, then a user's privilege must be larger than or equal to 100 to press this button.
- *Initial Value*: This field is used to set the initial value of the numeric control field.
- *Step Value*: This field is used to set the value of the numeric control field for each step.
- *High limit/Low limit*: This field is used to set high/low limit values of the numeric control field.
- *Restore the previous stop value*: This field is used to save the value of the control display at system stop, and the value will be restored at next system start.

Knob Control

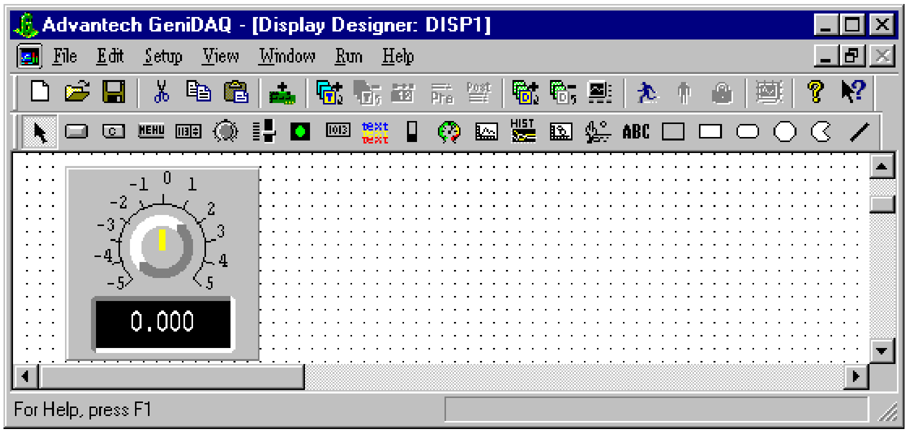


Figure 4-43: Knob Control Display Item in Workspace Window

Description

A numeric-type knob control may be drawn and interfaced (Output) to control a Task block variable with a certain tag name. The size of the display may be adjusted. This display item is used as an output from the keyboard or mouse; data is to be sent to a Task block variable by an operator who specifies the data. The knob may also be turned using the keyboard UP and DOWN arrow keys, if the focus is currently on the knob to be turned. (The "focus", a standard Windows term, refers to which display item currently can be controlled by the keyboard). The TAB key can be used to shift the focus from one item to another.

Knobs can be used to achieve supervisory control. The data is in real (floating point) format, and the display format (number of digits and location of the decimal point) may be chosen. The size and properties of the font used in this block can be changed by pressing the Font... button in the *Knob Control Display Item* dialog box.

Configuration Dialog Box

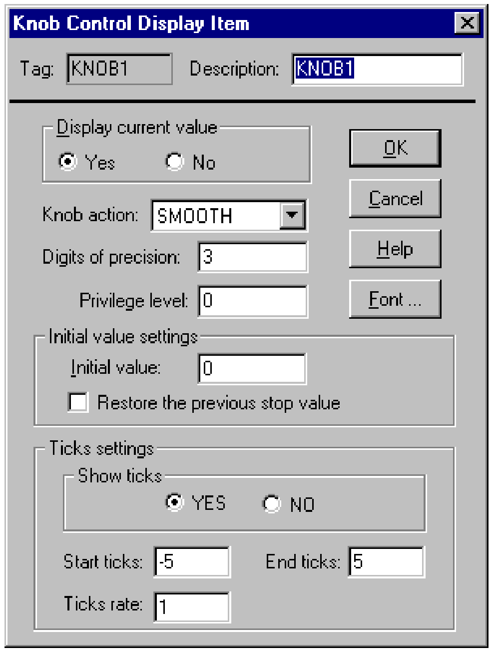


Figure 4-44: Configure Knob Control display item

Field Description

- *Display Current Value*: Specify whether the numeric display below the knob is active or not.
- *Knob Action*: Specify the knob action (either smooth or incremental).
- *Decimal Places*: Specify the desired number of decimal places after the decimal point.
- *Initial Value*: Specify to which numeric value the knob will point at Runtime Startup.
- *Privilege level*: This field is used for protection of system control. The privilege level is from 0 to 255, with the larger number having a higher privilege. For example, if the privilege level of a button is 100, then a user's privilege must be larger than or equal to 100 to press this button.
- *Show Ticks*: Specify whether Ticks will be displayed.
- *Start Ticks*: Specify the lowest number the knob will output (i.e. where the Ticks will start).
- *End Ticks*: Specify the highest number the knob will output (i.e. the Ticks ending number).
- *Ticks Rate*: Specify the rate at which the Ticks will increment.
- *Restore the previous stop value*: This field is used to save the value of the control display at system stop, and the value will be restored at next system start.

Slider Control

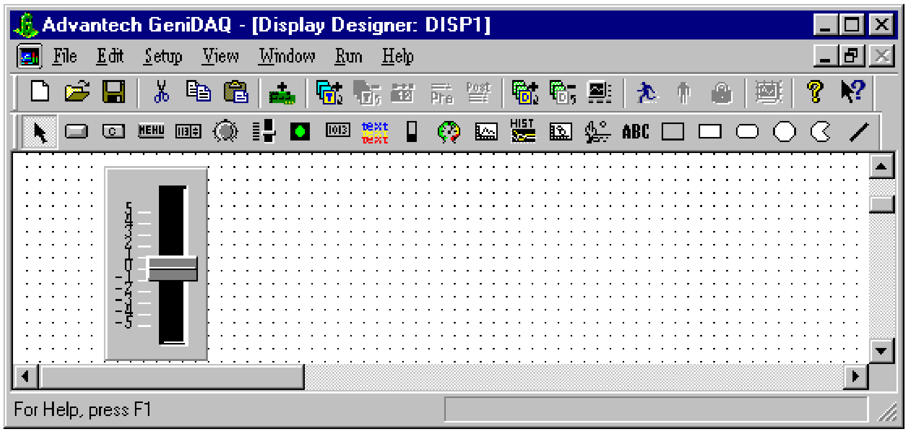


Figure 4-45: Slider Control in Workspace Window

Description

A numeric-type slider control may be drawn and interfaced (Output) to control a Task block variable with a certain tag name. The display and slider size may be changed. This display item is used as an output from the keyboard or mouse. Data is to be sent to a Task block variable by an operator who specifies the data.

The slider may also be moved using the UP and DOWN arrow keys, provided the focus is currently on the slider (The “focus”, a standard Windows term, refers to which display item currently can be controlled by the keyboard). Choosing which display item currently has the focus may be done using the TAB key. The slider control can be used to achieve Supervisory Control. The data is in real (floating point) format.

Configuration Dialog Box

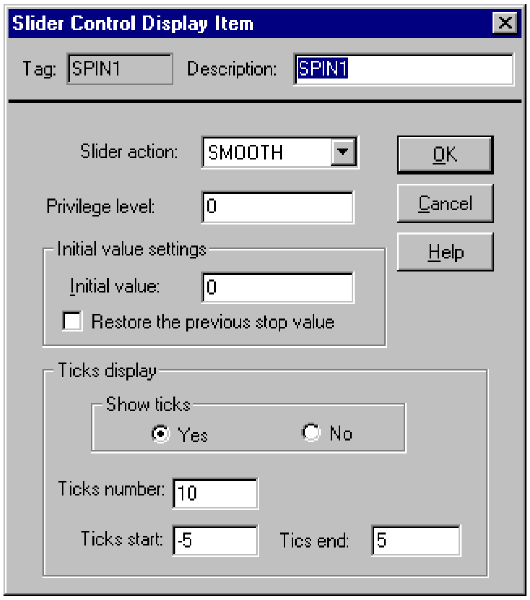


Figure 4-46: Configure Slider Control display item

Field Description

- *Slider Action*: Specify the slider action (either smooth or incremental).
- *Initial Value*: Specify to which numeric value the slider will point at Runtime Startup.
- *Privilege level*: This field is used for protection of system control. The privilege level is from 0 to 255, with the larger number having the higher privilege. For example, if the privilege level of a button is 100, then the user's privilege must be larger than or equal to 100 to press this button.
- *Show Ticks*: Specify whether Ticks will be displayed.
- *Ticks Start*: Specify the lowest number the slider will output (i.e. where the Ticks will start).
- *Ticks End*: Specify the highest number the slider will output (i.e. the Ticks ending number).
- *Ticks Number*: Specify how many total Ticks will be displayed. This entry will be grayed out if "Show Ticks" is set to "No".
- *Restore the previous stop value*: This field is used to save the value of the control display at system stop, and the value will be restored at next system start.

Working with Cell Objects

You can use cell objects to assemble your own pictures, such as pumps or valves. The cell objects include:

- Rectangle cell
- Rounded rectangle cell
- Oval cell
- Polygon cell
- Line cell

GeniDAQ provides graphical tools to draw pumps, valves, rectangles, circles, segments, and polygons. It allows the user to configure the colors and sizes of these figures. These drawing tools include oval, rectangle, round rectangle, polygon and line. In addition, GeniDAQ provides **Make Object** and **Break Object** commands to let you integrate drawing components into a meaningful picture for your data acquisition and control.

Grouping and Rotating Cell Objects

To group two or more cell objects:

1. Use the cell object icons to draw the objects that you want to group.
2. Use your mouse pointer to surround all of the objects. All of the handles on all of the objects should be visible to signify that they are selected.
3. Select **Edit | Make Object** from the main menu. Your objects have now been grouped into a single object. To break the object apart, select it and then select **Edit | Break Object** from the main menu.

To rotate an object:

1. Highlight the object that you want to rotate and then select **Edit | Rotate Clockwise** or **Edit | Rotate C-Clockwise** from the main menu.

Configuring Cell Objects

All of the cell objects share a common configuration dialog box:

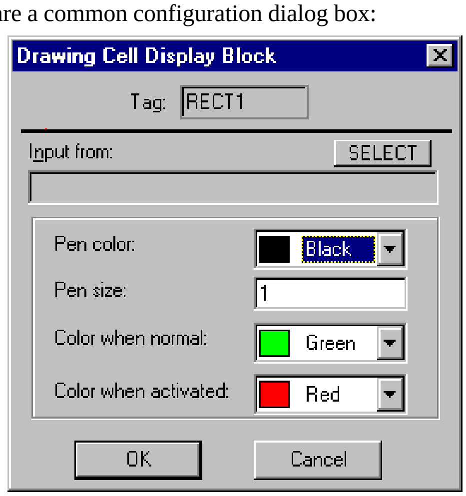


Figure 4-47: Configure Rectangle Drawing Display Item Configuration Dialog Box

Field Description

- *Input from*: Specify the input from value.
- *Pen Color*: Specify the color of pen to fill the rectangle graphic object. There are 16 colors from which to choose.
- *Pen Size*: Specify the size of pen to draw the shape of graphic object. The unit of size is dots.
- *Color in Normal*: Specify the display color of the graphic object while the input value is equal to 1.
- *Color in Activation*: Specify the display color of the graphic object while the input value is equal to 0.

Rectangle Drawing Display Item

This display item is used to draw a rectangle graphic object in the display window. When a graphic is selected, you can drag the corner to size the object. This display item has input capability. It accepts a value between zero (0) and one (1) from a Task block, each value providing capability to select color to be displayed. When this display item is double-clicked upon, a dialog box will appear for configuration.

Rounded Rectangle Cell

This display item is used to draw a rounded rectangle graphic object at the display window. The functions of the rounded rectangle drawing tool are the same as those of the rectangle drawing tool. Please refer to the previous section.

Oval Cell

This display item is used to draw an oval graphic object at the display window. The functions of the oval drawing tool are the same as those of the rectangle drawing tool. Please refer to the previous section.

Polygon Cell

This display item is used to draw a polygon graphic object at the display window. The functions of the polygon drawing tool are the same as those of the rectangle drawing tool. Please refer to the previous section.

Line Cell

This display item is used to draw a line graphic object at the display window. The functions of the line drawing tool are the same as those of the rectangle drawing tool. Please refer to the previous section.

Note: The \Strategy\Tutor4 example demonstrates how to use drawing tools to customize your display. Please refer to it for the detailed.

Summary

Advantech GeniDAQ's display designer provides an object-based development environment that allows you to create your operator display panel intuitively. You can create a panel that is similar to industrial process displays or test equipment. You can also attach a bitmap background to customize your display. The operator display allows you to monitor, supervise, and control your process during runtime. For control objects, they can be controlled using a mouse or a keyboard protected with security.

In addition, Advantech GeniDAQ also provide graphic tools to draw rectangles, circles, segments, and polygons. These objects or cells can be link to a tag value. They can change color according to the tag value. They can also be grouped together to make a single object. You can use them to draw pumps, valves or other industrial symbols.

5

Connecting Your Devices

Overview

There are two ways to link with your devices. The first one is the interface with internal I/O drivers for Advantech I/O hardware. With the interface, GeniDAQ accesses Advantech I/O hardware through Advantech DLL drivers. The other one is the interface with OLE for Process Control (OPC) standard driver interface. In your plant or system, there may already exist some devices, instead of Advantech I/O. GeniDAD leverages the industry OPC standard to provide the plug-and-play connectivity with your devices, such as programmable logic controllers (PLCs). Most of major PLC vendors provide the OPC servers for their hardware. With OPC, you can easily integrate your devices.

For Advantech I/O hardware, it supports Advantech's DLL driver. The DLL drivers are bundled with GeniDAQ. For devices other than Advantech I/O hardware, it supports OPC servers. If your device provides an OPC server, GeniDAQ can access it.

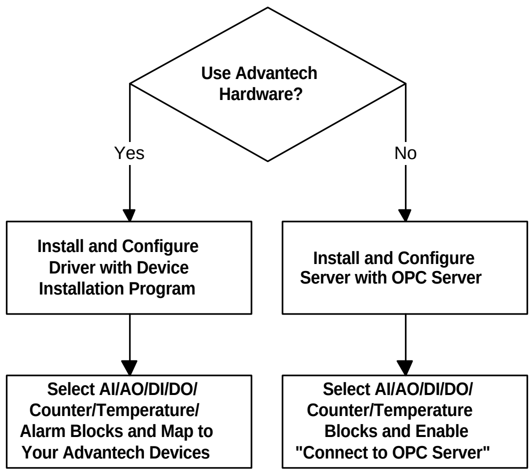


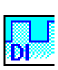
Figure 5-1: Connecting Your Hardware With GeniDAQ

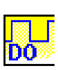
If you are using Advantech I/O hardware, you must use the *Device Installation Utility*, bundled with GeniDAQ, to install and configure the device. You can then use I/O blocks, such as AI/AO/DI/DO/ Counter/Temperature/Alarm to map to your devices. If your are not using Advantech I/O hardware, you can use an OPC server interface by enabling the "Connect to OPC Server" option in these I/O blocks except Alarm block. However, before connecting to the OPC server, you must install and/or configure your OPC server. Please refer to your OPC server documentation.

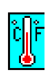
I/O Blocks

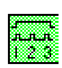
 Analog Input

 Analog Output

 Digital Input

 Digital Output

 Temperature Measurement

 Hardware Event/Frequency/Pulse Output

 Hardware Alarm

 RS-232

Contents

- Using Advantech DLL drivers
- Connecting devices with OPC standard interface
- Analog input
- Analog output
- Digital input
- Digital output
- Temperature measurement
- Counter/Frequency measurement/Pulse output
- Hardware alarm
- RS-232
- Performance Test
- Summary

Note: *GeniDAQ includes two OPC servers, ADAM OPC and ModBus OPC. Please refer to Appendix C and D.*

Note: *The current version of GeniDAQ CE doesn't support DDE functions in I/O blocks.*

Note: *For I/O configuration of GeniDAQ CE, please refer to Chapter 12.*

Using Advantech DLL Drivers

Using Advantech DLL drivers to connect Advantech I/O devices. GeniDAQ is compatible with the DLL drivers V1.3 or higher. The DLL drivers are bundled with GeniDAQ installation CD-ROM disc. When you install GeniDAQ, it will detect the driver on your system and install it automatically if no driver installed or the driver version less than V1.3.

Installing and Configuring Advantech I/O Devices

This section describes how to use the Device Installation Utility (DEVINST.EXE) to install and configure your device before using I/O blocks within GeniDAQ. It applies to Advantech I/O hardware. The basic steps are as follows. The following example installs and configures a demo board, and you follow this general procedure to set up and configure any device that you need to use.

1. Launch the *Device Installation Utility* by selecting **Add | Devices** from the main menu. Alternatively you can click the **Add Devices** toolbar icon which is available in both the *Task Designer* and *Display Designer*.

Add Devices Toolbar Icon

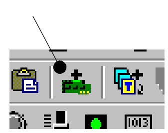


Figure 5-2: The Add Devices Toolbar Icon

2. The Device Installation Utility loads as shown below:

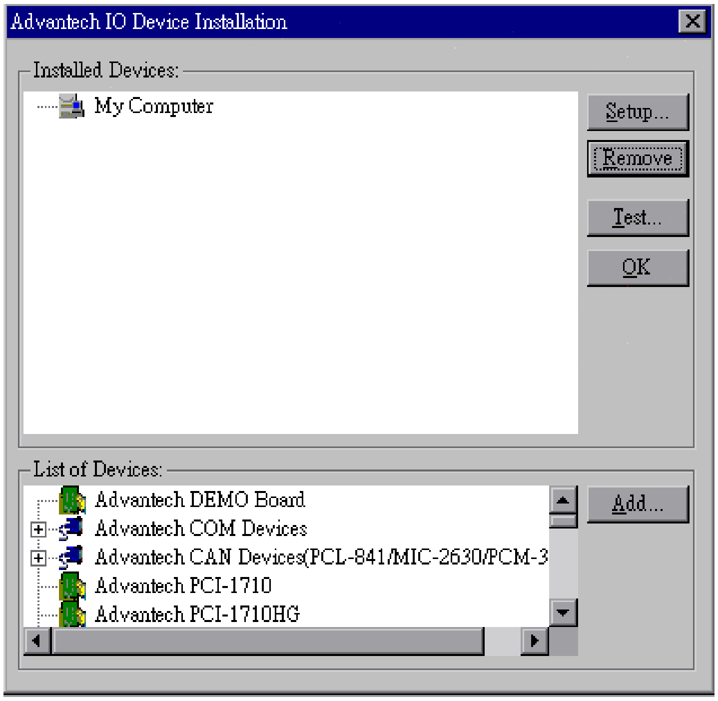


Figure 5-3: Device Installation Utility Main Screen

The *Installed Devices* pane displays the Advantech hardware that is currently set up to run on your computer. The *List of Devices* pane shows Advantech hardware for which the drivers can be installed to enable their use.

3. Highlight the *Advantech DEMO Board* entry in the *List of Devices* pane and click the **Add…** button. A configuration dialog box is displayed to configure the device that you are adding.

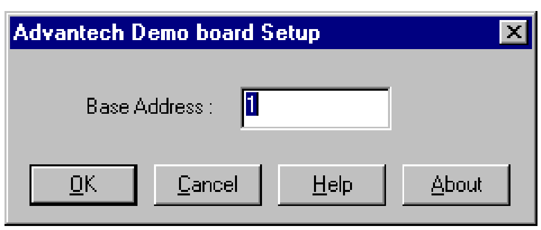


Figure 5-4: Device Configuration Dialog Box

4. Use the default value and press the **OK** button. You will see a new entry in the *Installed Devices* list.

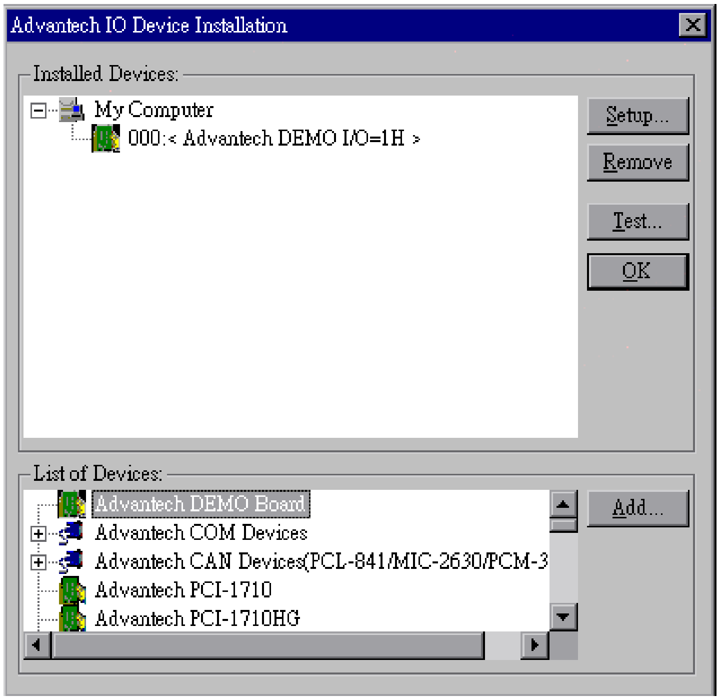


Figure 5-5: I/O Device Installation Dialog Box Showing New Device

5. If you want to test the device that you have just installed, click the device entry in the *Installed Devices* pane and then click the **Test…** button.
6. Click the **Close** button and exit the *Device Installation Utility*.

Porting Device Configuration to Another Machine

GeniDAQ allows you to port the Advantech device configuration from one machine to another machine. It saves your time to reconfigure the devices on another machine. First you export (run “ADSDEVICEINSTALL.EXE”) the device configuration from Registry to a *.reg file on one machine. Then import the device configuration from the *.reg file to Registry on another machine.

To import the Advantech device configuration, run “ADSDEVICEINSTALL.EXE” from the directory where GeniDAQ is installed. Select the “Import” option from the “File” menu in the “ADSDEVICEINSTALL.EXE” utility.

To export a device configuration, you have to launch the device installation program by clicking on the Device Installation icon in the GeniDAQ 4.0 folder from the Start menu. Then click on the File|Export menu to export the configuration file to a *.reg file. Also you can import a device configuration by clicking on the **File | Import** menu.

To export the Advantech device configuration, run “ADSDEVICEINSTALL.EXE” from the directory where GeniDAQ is installed. Select the “Export” option from the “File” menu in the “ADSDEVICEINSTALL.EXE” utility.

Connecting Devices with OPC Standard Interface

Configuring OPC Communication Settings

After you install and configure your OPC servers, you can configure GeniDAQ's OPC settings to optimize communication with the OPC servers. These include asynchronous or synchronous communication, cache or device data type, update rate and deadband. You can activate the OPC configuration dialog box by selecting **Setup | Task Properties** from the main menu of Task Designer and clicking the **OPC Setting** button.

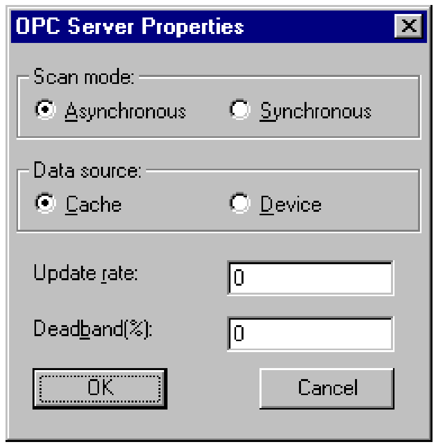


Figure 5-6: OPC Server Properties Configuration Dialog Box

Field Description

- *Scan Mode*: Specifies asynchronous or synchronous mode scan. Asynchronous mode configures the OPC server to transfer data only when data is changed. It is more efficient. Synchronous mode always scans data from the OPC server.
- *Data Source*: Specifies the data source from cache or device when GeniDAQ requests data for the OPC server. The OPC server scans the physical device at a fixed rate (the Update Rate). The scan data will stored in memory. The cache option means the data is stored in the memory of the OPC server. It's more efficient. For a device data source, the OPC server retrieves data from the physical device.
- *Update Rate*: Specifies the update rate that the OPC server scans the physical device.
- *Deadband*: Specifies the percentage change in an item value when the OPC server causes a callback to GeniDAQ.

Note: All items in a task have the same OPC properties. Each task has its own OPC properties.

Mapping OPC Items to I/O Blocks

After you configure the OPC communication settings, you can map OPC items to I/O tags. You can activate the OPC item configuration dialog box in all I/O blocks by enabling the *Connect to OPC server* option button. The *OPC Item Select* configuration dialog box is shown as below.

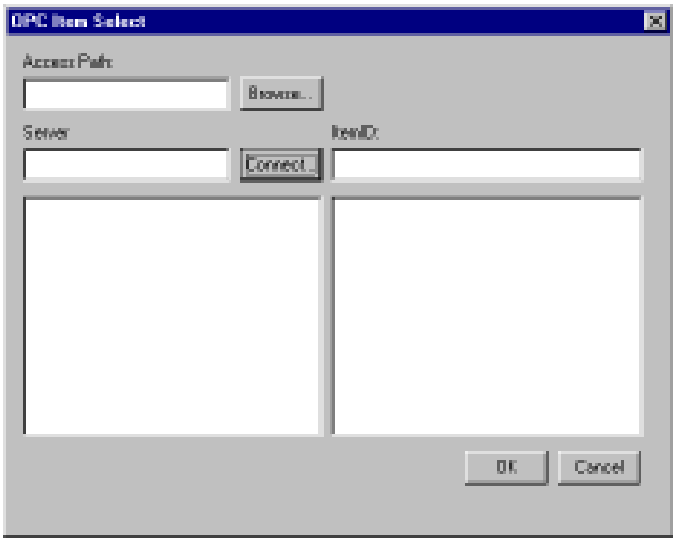


Figure 5-7: OPC Item Select Configuration Dialog Box

Field Description

- *Access Path*: The access path is intended as a way for the client to provide the server a suggested data path (e.g., a particular modem or network interface). It indicates how to get the data. It is optional and depends on the OPC server. You can input the access path manually or by pressing the **Browse** button to select the access path.
- *Server*: Specifies the OPC server that supports the desired device. The Server lists all of the installed OPC servers. Select one in the *Server* listing and click the **Connect** button. Then it will retrieve all defined items in the *Server* and put them in the *ItemID* list.
- *ItemID*: Specifies the OPC item that maps to the physical I/O point. The *ItemID* lists all of the defined items. Select the one you want to access.

Analog Input

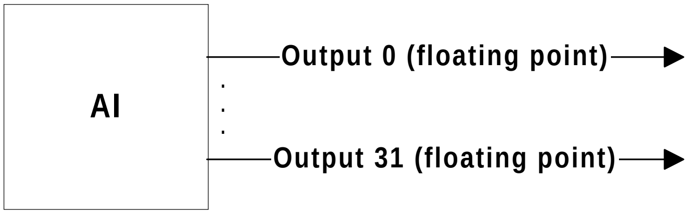


Figure 5-8: Analog Input Block

Block Information

Interface

- Number of inputs: 0
- Input type: None
- Number of outputs: depends on the hardware. The maximum is 32. For the devices connecting through OPC interface, there is only one channel output.
- Output type: floating point

Description

This block has output capability that supplies other blocks with analog input information from the I/O device. The Analog Input block supports

- Advantech I/O hardware: includes plug-in DA&C cards and ADAM-4000/5000 modules
- OPC standard interface

Dialog Box Configuration

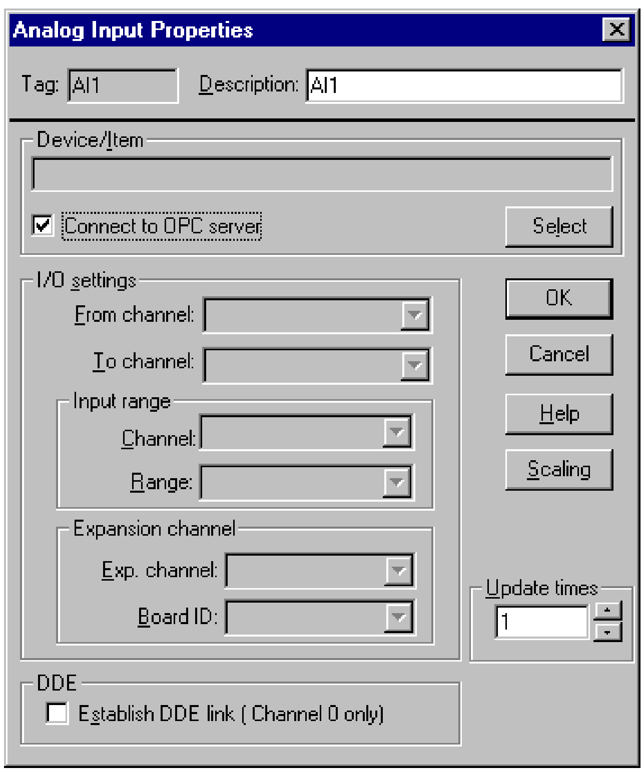


Figure 5-9: Analog Input Block Configuration Dialog Box

Field Description

- *Device/Item field:* Specifies the device or OPC item associated with the block.
- *From channel*: specifies the starting polling channel. The value ranges from zero (0) to the maximum number of hardware channels.
- *To channel:* specifies the ending polling channel. The value should be equal to or larger than the From Channel number.
- *Input range:* specifies the input value range of each hardware channel, for example -5V to +5V. This value is dependent on the hardware device. If there are multiple channels for a connected hardware device, you are advised to specify each channel's input range.
- *Expansion channel:* specifies the expanded daughterboard on a connected mainboard. Use this feature to select the correct expansion channel and board ID.
- *Update times:* The "Update times" is a divisor that allows the Analog Input block to have a different effective scan rate than the rest of the strategy. This is useful if, for example, your strategy is running at 100Hz, but you only want to sample at a rate of 20Hz. For this example, you would set the Update times to 5 (100 divided by 5 (the update times) gives an effective scan rate of 20Hz). In this scenario, you will still get 100Hz data if you send the output to a Log File block or a display block, but only one in five samples will be "real". The other samples are merely copies of the "real" sample. Valid values for the Update times are between 1 and 32767.
- *Establish DDE Link field:* The Digital Input block also has DDE capabilities which allow it to exchange data with other Windows applications. For more information about DDE, please refer to DDE Client/Server block.
- *Scaling button:* Scaling button is used to re-scale input value range to the desired value range. The scaling dialog box is below:

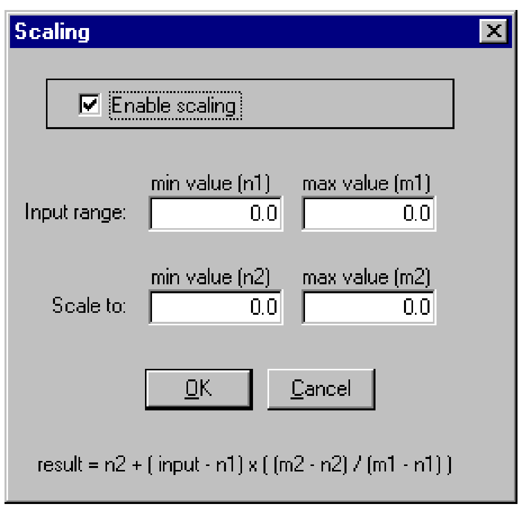


Figure 5-10: Analog Input Scaling Dialog Box

For example, if the input range is -5 to +5, then you can adjust it to be 0 to 10.

- Wiring In: GeniDAQ will display a window with the error message “Cannot accept input”.
- Wiring Out: Multiple channels can be selected to output data to another connected block. The maximum number of channels is 32.

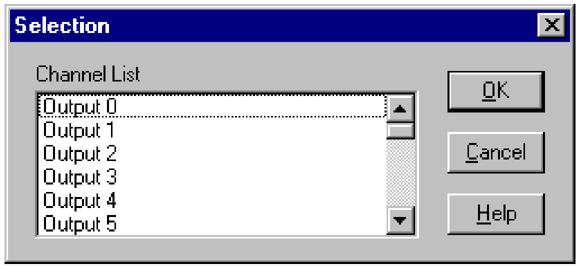


Figure 5-11:Analog Input Block’s Wiring out Dialog Box

Through Advantech DLL Driver Interface

Connecting Plug-in DA&C Cards

Depending on the hardware that you’re using, the analog input may have multiple channels. The *From channel* and *To channel* fields specify the scan channels. Configure the input ranges in the *Input Range* field for all channels. Some plug-in DA&C cards can connect to an expansion board to measure the signal. In this case, use the *Expansion channel* field to select the corresponding expansion channel and board ID. The field is enabled only when you have configured an expansion board with the Device Installation Utility.

Note: *If the “From channel” is 2 and the “To channel” is 4, and you want to get the value of Channel 3, you have to select the Output 3 by connecting the analog input block to another block.*

Connecting ADAM-4000/5000 Series Modules

Depending on your hardware, the analog input may have multiple channels. The *From channel* and *To channel* fields specify the scan channels. The *Input range* and *Expansion channel* fields are disabled.

Through OPC Interface

To connect devices through an OPC interface, you have to enable the *Connect to OPC server* option button and then click the **Select** button. You can then map an OPC item to output 0 of the analog input. Please refer to the *Connecting Devices with OPC Standard Interface* section.

Note: *For OPC connection, analog input only has one output.*

Analog Output

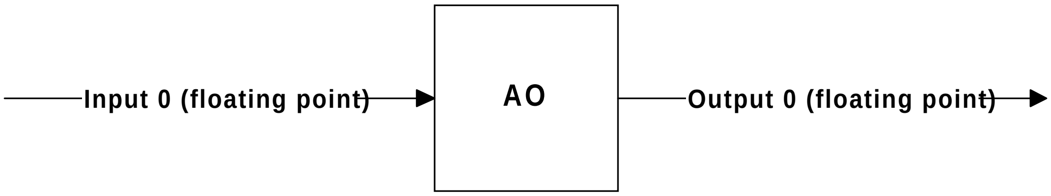


Figure 5-12: Analog Output Block Information

Block Information

Interface

- Number of inputs: 1
- Input type: floating point
- Number of outputs: 1
- Output type: floating point

Description

This block has input capability that accepts another block's analog data, then forwards the data to the selected I/O device. Analog output block supports

- Advantech I/O hardware: includes plug-in DA&C cards and ADAM-4000/5000 modules
- OPC standard interface.

Dialog Box Configuration

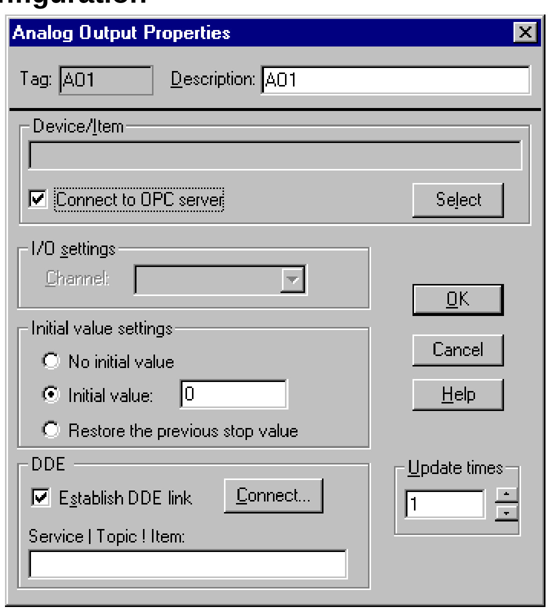


Figure 5-13: Analog Output Block Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the device or OPC item associated with the block.
- *Channel field*: This field is used to specify the hardware device channel that AO block will output data to. The value of channel field will depend on the connected hardware device.
- *Update times field*: The "Update times" is a divisor that allows the Analog Output block to have a different effective scan rate than the rest of the strategy. This is useful if, for example, your strategy is running at 100Hz, but you only want to output data at a rate of 20Hz. For this example, you would set the "Update times" to 5 (100 divided by 5 (the update times) gives an effective scan rate of 20Hz).
- *DDE field*: The Analog Output block has DDE capabilities, which allow it to exchange data with other Windows applications. Through DDE field, other Windows applications can exchange data with AO block and/or output data to hardware device(s) directly. For more information about DDE, see "DDE Blocks (Client and Server)".
- *Initial value settings*: Specifies the initial value of the Analog Output block. There are three options, no initial value, with initial value and initial value form the previous stop.

Wiring Information

- *Wiring In*: Another block provides output data to the AO block and connected hardware device(s). There is only one input source. If an input source already exists, "The input already connected" message will be displayed.
- *Wiring Out*: Passes the input data to a connected block directly.

Digital Input

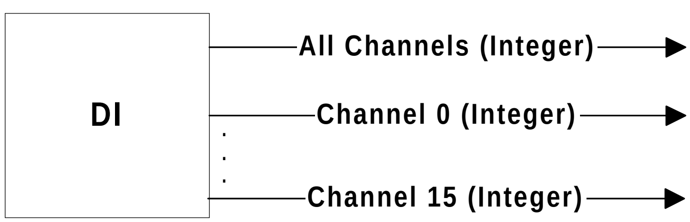


Figure 5-14: Digital Input Block

Block Information

Interface

- Number of inputs: 0
- Input type: none
- Number of outputs: 17 ("All Channels", and "Channel 0" to Channel 15")
- Output type: integer

Description

This block has output capability that supplies other blocks with digital input information from the I/O device. For "All Channels" output, the output value is from 0 to 2^16. For "Channel 0" to "Channel 15" output, the output value is 0 or 1. Digital Input block supports

- Advantech I/O hardware: includes plug-in DA&C cards and ADAM-4000/5000 modules
- OPC standard interface.

Dialog Box Configuration

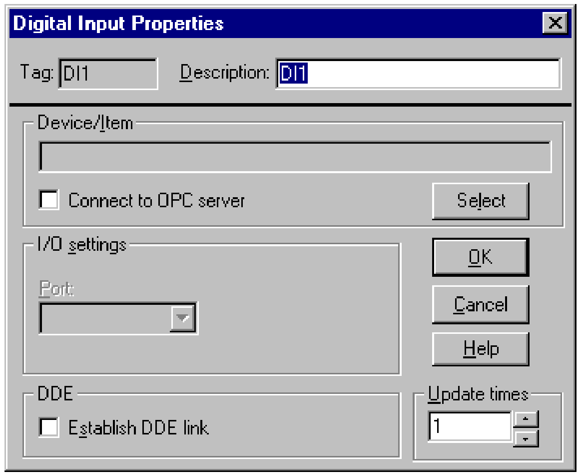


Figure 5-15: Digital Input Block Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the device or OPC item associated with the block.
- *Port field*: It is enabled only for using Advantech DLL driver interface. A port consists of 8 bits.
- *Update times:* The "Update times" is a divisor that allows the Digital Input block to have a different effective scan rate than the rest of the strategy. This is useful if, for example, your strategy is running at 100Hz, but you only want to sample at a rate of 20Hz. For this example, you would set the Update times to 5 (100 divided by 5 (the update times) gives an effective scan rate of 20Hz). In this scenario, you will still get 100Hz data if you send the output to a Log File block or a display block, but only one in five samples will be "real". The other samples are merely copies of the "real" sample. Valid values for the Update times are between 1 and 32767.
- *Establish DDE Link field*: The Digital Input block also has DDE capabilities which allow it to exchange data with other Windows applications. For more information about DDE, please refer to DDE Client/Server block.

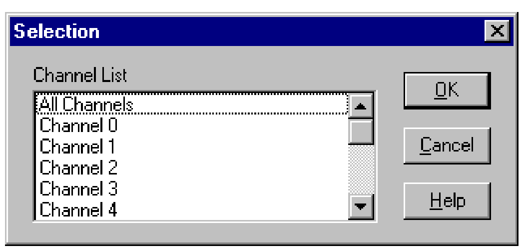


Figure 5-16:Digital Input Block's Wiring out Dialog Box

Wiring Information

- *Wiring In*: GeniDAQ will display a window with the error message “Cannot accept input”.
- *Wiring Out*: Passes the hardware device data to a connected block directly.

For “All Channels” output, the output value is from 0 to 2^16. For “Channel 0” to “Channel 15” output, the output value is 0 or 1.

Digital Output

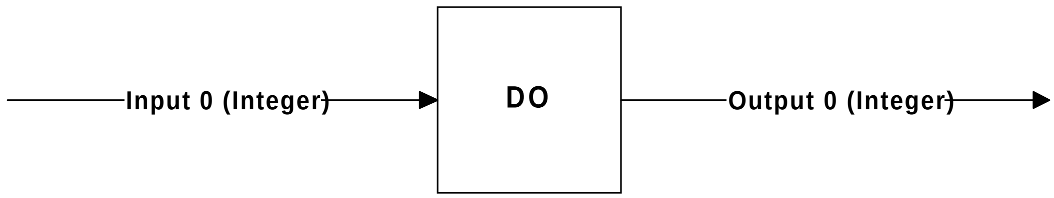


Figure 5-17: Digital Output Block

Block Information

Interface

- Number of inputs: 1
- Input type: integer
- Number of outputs: 1
- Output type: integer

Description

This block has input capability that accepts another block’s integer data and then forwards the data to the selected I/O device. The Digital Output block supports

- Advantech I/O hardware: includes plug-in DA&C cards and ADAM-4000/5000 modules
- OPC standard interface.

Dialog Box Configuration

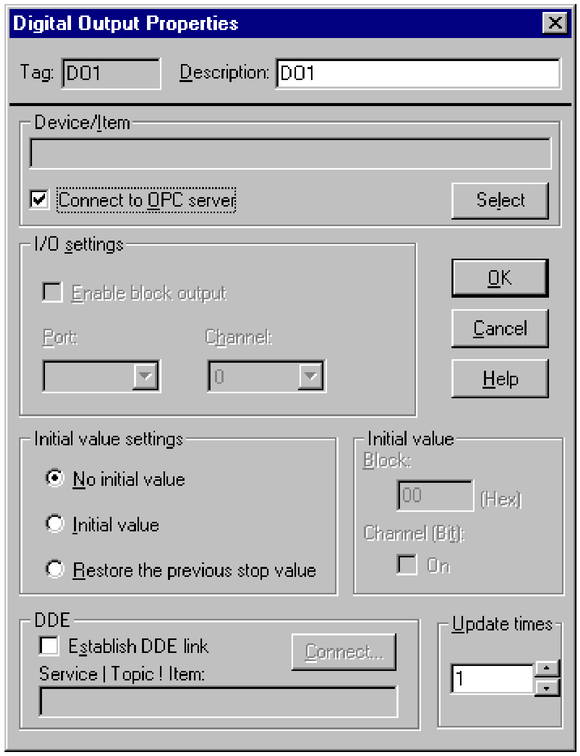


Figure 5-18: Digital Output Block Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the device or OPC item associated with the block.
- *Enable block output field*: The Digital Output block can output value to one digital output channel or 16 digital output channels at one scan. You can select 16 channels output by enabling the block output. The default is one channel (or bit) output. If you enable this option, you have to input a 16-bit value to this block.
- *Port field*: It is enabled only for using Advantech DLL driver interface. A port consists of 8 bits.
- *Channel field*: Specifies the output channel for one channel output.
- *Initial value settings*: Specifies the initial value of the Digital Output block. There are three options, no initial value, with initial value and initial value form the previous stop.
- *Initial value*: Specifies the initial value for block output or channel output. It is only enabled for the option with initial value checked.
- *Update times field*: The “Update times” is a divisor that allows the Digital Output block to have a different effective scan rate than the rest of the strategy. This is useful if, for example, your strategy is running at 100Hz, but you only want to output data at a rate of 20Hz. For this example, you would set the “Update times” to 5 (100 divided by 5 (the update times) gives an effective scan rate of 20Hz).

- *DDE field*: The Digital Output block has DDE capabilities, which allow it to exchange data with other Windows applications. Through DDE field, other Windows applications can exchange data with AO block and/or output data to hardware device(s) directly. For more information about DDE, see “DDE Blocks (Client and Server)”.

Wiring Information

- *Wiring In*: Another block directly outputs data to DO block and connected hardware device(s). There is only one input. If there is more than one input, “The input already connected” message will be displayed.
- *Wiring Out*: Passes the hardware device data to connected block(s) directly

Temperature Measurement

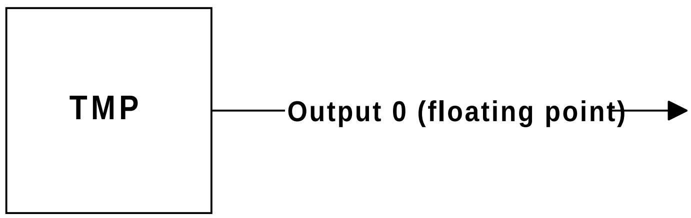


Figure 5-19: Temperature Measurement Block

Block Information

Interface

- *Number of inputs*: 0
- *Input type*: none
- *Number of outputs*: 1
- *Output type*: floating point

Description

Similar to the AI (analog input) block, this block allows for outputting data to another block directly from the I/O device. Transforms the analog input data from the I/O device into linearized temperature data in degrees Celsius, Fahrenheit, Kelvin, or Rankine. Thermocouple types supported are J, K, S, T, R, and E. Temperature measurement block supports

- *Advantech I/O hardware*: includes plug-in DA&C cards and ADAM-4000/5000 modules
- *OPC standard interface*.

Dialog Box Configuration

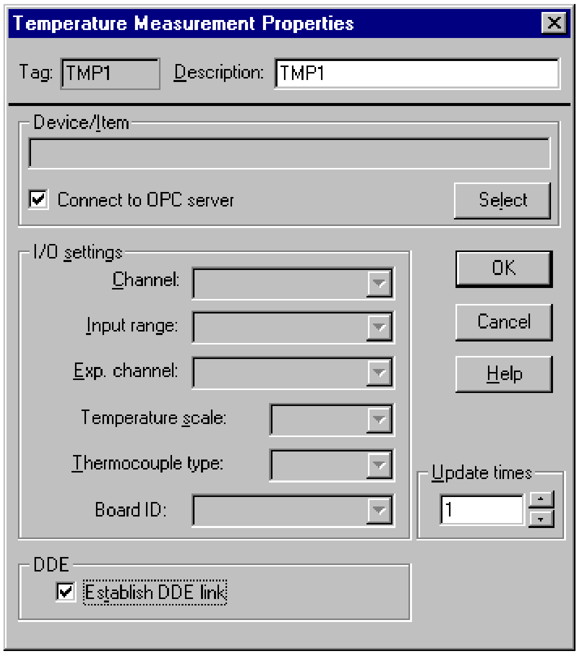


Figure 5-20: Temperature Measurement Block Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the device or OPC item associated with the block. For using Advantech DLL driver interface, you should install daughterboard for signal amplification with Device Installation program before configuring the Temperature Measurement block.
- *Channel*: Chooses the analog input device channel.
- *Input range*: Chooses the input range, if applicable.
- *Expansion channel*: Chooses the expansion (mux) card channel.
- *Temperature scale*: Chooses the desired temperature scale in degrees C (Celsius), F (Fahrenheit), K (Kelvin) , or R (Rankine).
- *Thermocouple type*: Chooses the type of thermocouple that the hardware supports.
- *Establish DDE Link*: Allows you to establish a link with other Windows applications. See “DDE Blocks (Client and Server)”.
- *Update times*: Changes the effective scan rate of this particular block. The value entered acts as a divisor; the scan rate divided by the update rate gives the effective scan rate for this block.

Wiring Information

- *Wiring In*: No wiring input connection. “Cannot accept input” message will be displayed.
- *Wiring Out*: Temperature Measurement block transforms the analog input data from the I/O device into linearized temperature data in degrees C, F, K, or R. Thermocouple types supported are J, K, S, T, R, and E.

Counter/Frequency Measurement/Pulse Output

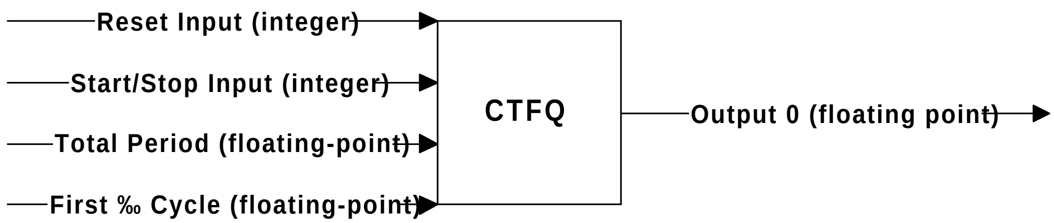


Figure 5-21: Counter/Frequency Measurement/Pulse Output Block

Block Information

Interface

- Number of inputs: 4
- Input type: integer/floating point
- Number of outputs: 1
- Output type: floating point

Description

This block has output capability that supplies other blocks with analog values from the I/O device. The Hardware Counter block supports

- Advantech I/O hardware: includes plug-in DA&C cards and ADAM-4000/5000 modules:
- OPC standard interface

Dialog Box Configuration

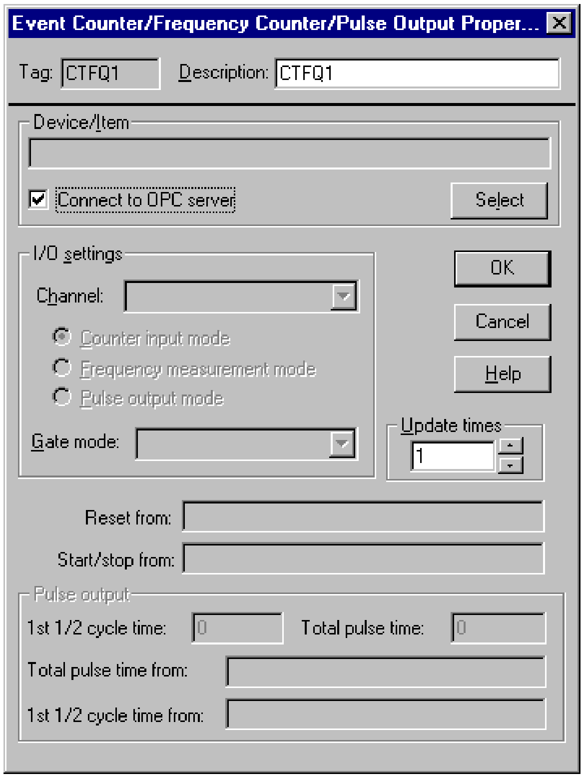


Figure 5-22: Event Counter/Frequency Counter/Pulse Output Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the device or OPC item associated with the block.
- Counter Input/Frequency Measurement option: A hardware device's counter/timer chip is used as a hardware event or frequency counter that counts digital rising edges (digital high events) from an external source that supplies digital information (TTL or other level 1's and 0's). The block may be used to control the output of the timer/counter chip (when supported by the driver), to be used as a pulse generator. The block's output can be sent to another block, such as the display block. All counting or pulse output is performed by the I/O card's timer/counter chip, and is not dependent on the sample rate of the strategy. The event counter is implemented as an up - counter; that is, the count starts at 0 (zero) and counts until it reaches the counter's maximum value (hardware/driver dependent). A down - counter may be constructed by using this block in conjunction with a Basic-Script Block or Single Operation Calculation (SOC) block and subtracting the counter output from the maximum count. In this way, the count will start at the maximum and will end at zero.
- Start/stop from: If the Start/Stop Input is connected, the counter or pulse generator is started and stopped by this input. This allows for total control over counter operation during runtime. If the start/stop input is not connected, the counter will start when the strategy begins and stop when it ends. To start the counter using the start/stop input, provide a rising edge (from low (zero) to high) to this input from another block. This will start the hardware counter from zero. Counter status is output from the counter/frequency/pulse output block with every scan of GeniDAQ, unless the

divisor (explained below) is set to a value other than 1 (one). By applying a falling edge (from high to low) digital value to the start/stop input, the counter may be stopped at the current value.

- Reset from: By connecting a rising edge value to the block's Reset Input, the count can be reset to its starting value and counting is resumed. A falling edge value to the reset input will have no effect on counting (reset input not connected is treated as a low).
- Pulse Output Option: You can create a pulse generator output from the counter/timer section of the I/O device if supported by the DLL driver. To do so, specify the Total Period and first 1/2 cycle time (in seconds). You can use the static values specified in the dialog box or supply the block with floating point values on its input from another block. Not all I/O devices support a varying first 1/2 cycle due to hardware limitations of the counter/timer chip. In this case, when you specify a total period the device will generate a 50% duty cycle square wave on its output pin. Check the DLL driver on-line help for specifications on hardware support.

If the Total Period Input is connected to a block that supplies floating point output, such as the User Programmable Block, the total pulse time (1/frequency) of the pulse output is controlled by this input. This allows for control over total pulse frequency operation during runtime. If the Total Period input is not connected, the counter will use the static values entered in the dialog box when the strategy begins.

If the First 1/2 Cycle Input is connected to a block that supplies floating point output such as the User Programmable Block, the first 1/2 cycle time (1/frequency) of the pulse output is controlled by this input. This allows for total control over first 1/2 cycle pulse frequency operation during runtime. If the first 1/2 cycle input is not connected, the counter will use the static values entered in the dialog box when the strategy begins.

- *Gate Mode*: External Gating — the counter/timer chip may be started and stopped via external level control on a special input pin. If the hardware timer/counter and DLL driver supports external hardware gating, setting this value to high level or low level will enable the timer/counter chip to allow for gating control. Thus, if the counter is started at either the strategy start or using the start/stop input, the actual counting can't take place until the external gate senses the proper level on its input pin.
- *Update times field*: The "Update times" is a divisor that allows the Counter/Frequency/Pulse Output block to have a different effective scan rate than the rest of the strategy. This is useful if, for example, your strategy is running at 20Hz, but you only want to sample the counter at a rate of 4Hz. For this example, you would set the Update Rate to 5 (20 divided by 5 (the update rate) gives an effective scan rate of 4Hz). In this scenario, you will still get 20Hz data if you send the output to a Log File block or a display block, but only one in five samples will be "real". The other samples are merely copies of the "real" sample. Valid values for the update rate are between 1 and 32767.

Note: A separate Counter/Frequency/Pulse Output block is needed for each individual hardware counter/timer channel.

Wiring Information

- Wiring In: There are four input items for this block: Start/Stop Input, Reset Input, Total Period Input and First 1/2 Cycle Input. For each wiring input, you have to select one of the above.

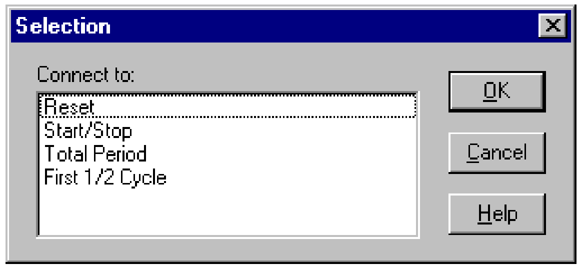


Figure 5-23: Counter/Frequrency/Pulse Block's Wiring in Dialog Box

- Wiring Out: Passes the counter/frequency/pulse data to another connected block.

Hardware Alarm

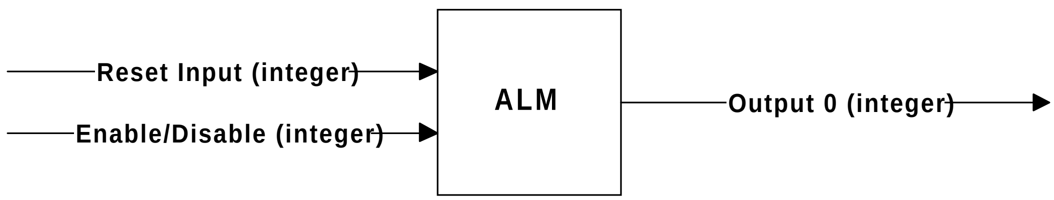


Figure 5-24: Hardware Alarm Block

Block Information

Interface

- Number of inputs: 2
- Input type: integer
- Number of outputs: 1
- Output type: integer

Description

This block has output capability that supplies other blocks with alarm information from the I/O device. Hardware alarm block supports

Advantech I/O hardware: includes ADAM-4000/5000 modules:

Dialog Box Configuration

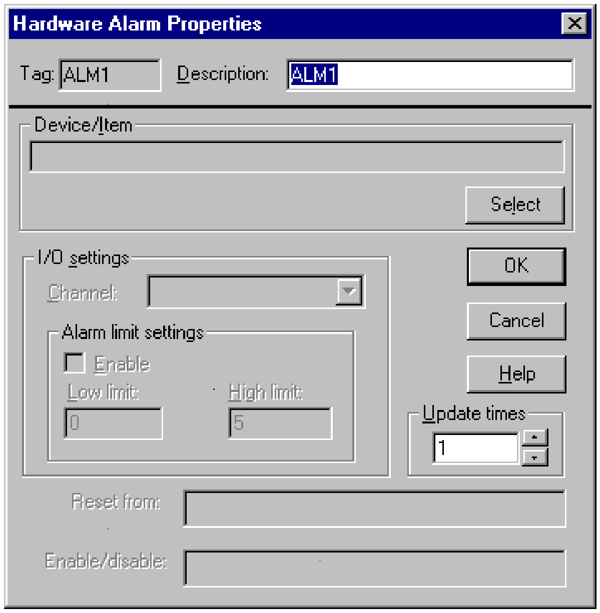


Figure 5-25: Digital Alarm Block Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the device associated with the block. Please make sure the hardware alarm is enabled when the device is installed ("Alarm enabled" field is YES) as below.

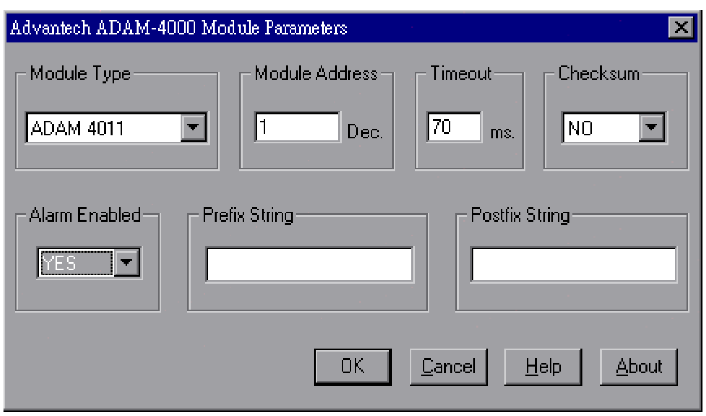


Figure 5-26: Advantech ADAM-4000 Module Parameters Configuration Dialog Box

- Alarm limit settings: After selecting the hardware alarm channel, you can set the alarm range (high and low values).
- Enable/disable input: If the Enable/Disable Input is connected, the alarm is enabled and disabled using this input. This allows for total control over alarm operation during runtime. If the enable/disable input is not connected, the alarm will be enabled when the strategy begins and disabled when it ends. To enable the alarm using the enable/disable input, provide a rising edge (from low (zero) to high) to this input from another block. Alarm status is output from the hardware alarm block with every scan of GeniDAQ, unless the divisor (explained below) is set to a value other than 1 (one). By applying a falling edge (from high to low) digital value to the enable/disable input, the alarm may be disabled.
- Reset Input option: By connecting a rising edge value to the block's Reset Input, the alarm is reset to zero and alarm operation is resumed. If the option is not enabled, a falling edge will be treated as a low.
- Update times field: The "Update times" is a divisor that allows the Alarm block to have a different effective scan rate than the rest of the strategy. This is useful if, for example, your strategy is running at 20Hz, but you only want to sample the alarm status at a rate of 4Hz. For this example, you would set the Update Rate to 5 (20 divided by 5 (the update rate) gives an effective scan rate of 4Hz). In this scenario, you will still get 20Hz data if you send the output to a Log File block or a display block, but only one in five samples will be "real". The other samples are merely copies of the "real" sample. Valid values for the update rate are between 1 and 32767.

Wiring Information

- Wiring In: Hardware Alarm Block accepts the input data as reset or enable/disable and displays the information in the configuration dialog box.

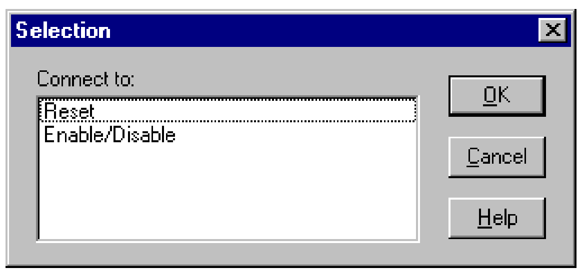


Figure 5-27: Hardware Alarm Block's Wiring in Dialog Box

- Wiring Out: The Hardware Alarm block outputs one of three levels:

  0 = No Alarm has occurred

  1 = Low Alarm is now set

  2 = High Alarm is now set

RS-232

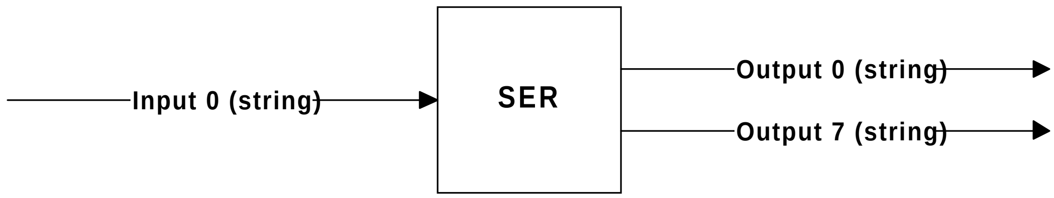


Figure 5-28: RS-232 Block

Block Information

Interface

- Number of inputs: 1
- Input type: string
- Number of outputs: 8
- Output type: string

Description

The RS-232 block (or Serial Interface block) is used for communication between the GeniDAQ host computer and other serial devices (other computers, ADAM modules, etc.) that support the RS-232 standard.

Data in the form of a prompt string can be sent out to the serial device, and the response can be fed to another block within GeniDAQ. If the prompt string is to be static (not to be changed), then the string is entered in the dialog box by the user. As a dynamic alternative, the prompt string may be sent in the form of an input to the block by connecting a BasicScript block or other block capable of outputting string variable types.

This block has output capability that supplies other blocks with a string from the serial port. The RS-232 block supports the standard serial port devices.

Dialog Box Configuration

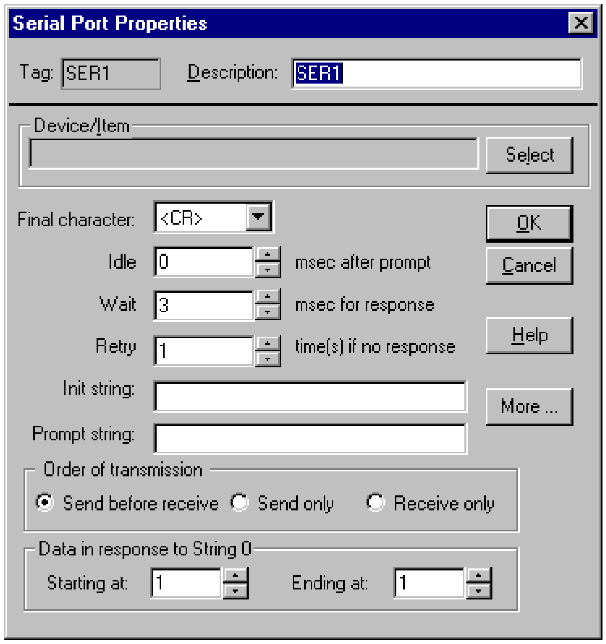


Figure 5-29: Serial Port Interface Block Configuration Dialog Box

Field Description

- *Device/Item field*: Specifies the COM port device associated with the block. Please make sure to install and configure COM port settings with Device Installation program before using the block.
- *Idle time:* the time (in ms) that GeniDAQ will wait before it starts looking for a response from the serial device. This feature is very convenient since some serial devices are very slow to respond. Using an idle time will eliminate time-out errors when slow serial devices are used.
- *Wait time:* the time (in ms) that GeniDAQ will wait for a return string after the idle time has elapsed. If the wait time passes with no string received, or no final character, then GeniDAQ will retry sending the prompt string (see below).
- *Retry:* the number of times that GeniDAQ will retry sending the prompt string before terminating. Acceptable numbers for retry are between 0 and 3.

Note: The sum (Idle+Wait) must be less than the scan task period.

- *Initial string (Init String):* Used to configure the serial device. It will be sent out as a first string, and the data that is sent back to GeniDAQ will be thrown away.
- *Prompt String:* After the initial string is sent, and the response (which is ignored) is received, the Prompt String will be sent, after which all data received back (Response String) can be used by another block that is connected to the RS-232 block. You must specify the starting and ending point with respect to the data in the string. By pressing More button, additional response strings may be entered in the Additional Response Strings dialog box (shown below).

Note: *The "Init String" and "Prompt String" fields allow the user to enter control characters in the range of ASCII 0 to ASCII 31.*

For example, entering "This ^A^B^C^[String^M" is converted to "This <Ctrl_A><Ctrl_B><Ctrl_C><ESC> String<CR>" where <Ctrl_A> is ASCII 1 and <ESC> is ASCII 27.

ASCII	Enter	Meaning
0	^@	Null
1	^A	Start of Heading
2	^B	Start of Text
3	^C	End of Text
4	^D	End of Tape
5	^E	Enquiry
6	^F	Acknowledge
7	^G	Bell
8	^H	Backspace
9	^I	Horizontal Tab
10	^J	Line Feed
11	^K	Vertical Tab
12	^L	Form Feed
13	^M	Carriage Return
14	^N	Shift Out
15	^O	Shift In
16	^P	Data Link Escape
17	^Q	Device Control 1
18	^R	Device Control 2
19	^S	Device Control 3
20	^T	Device Control 4
21	^U	Negative Acknowledge
22	^V	Synchronize
23	^W	End of Transmitted Block
24	^X	Cancel
25	^Y	End of Medium
26	^Z	Substitute
27	^[	Escape
28	^\	File Separator
29	^]	Group Separator
30	^^	Record Separator
31	^_	Unit Separator

The string entered will be converted to a final string using the following scheme:

1. The "^" character followed by a character from "@" to "_" is interpreted as the lower 32 control characters in the ASCII table. ^@ is NUL, ^A is control-A, ^B is control-B, etc. (letters: 'A' to 'Z' are upper case only)
2. Backquote character "`", which is also called a grave accent, means the next character will be recognized literally, rather than converted to a special character. For example "`|" is the ASCII 124, "`^" is the "^" character, and "``" is a single backquote character because the first single backquote character protects the second one from being converted.

- *More button:* By pressing More button, an Additional Response Strings dialog box will appear.

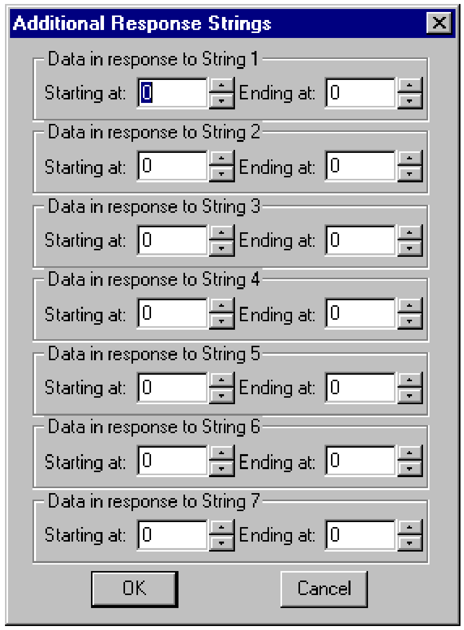


Figure 5-30: RS-232 Block's Additional Response String Dialog Box

In this dialog box, you can specify up to seven (7) additional response starting and ending locations with respect to characters in the string.

- Wiring In: RS-232 blocks accept input data as prompt string. If a prompt string is to be in static mode (not to be changed), then the string is entered in the dialog box by the user. As a dynamic alternative, the prompt string may be sent in the form of an input to the block by connecting a User Programmable or other block capable of string variable types.
- Wiring Out: RS-232 blocks output the response to another connected block within GeniDAQ.

Performance Test

The purpose of this section is to provide a framework for understanding the performace connected to ADAM modules.

Procedure

- Connect an input module to a PC, including ADAM 4000 and 5000 series.
- Use ADAM, OPC for ADAM, OPC for ModBus as interface drivers.
- Build an AI or a DI block in GeniDAQ Task, to get the input value.
- Each AI or DI block scan channel 0-7, total 8 points.
- Duplicate N blocks to get N * 8 points.
- Build a Timer block & a Basic Script block to get the time difference between each scan.

Testing Condition

- Communication Baud Rate: 38400
- Platform: IPPC-950 with Pentium-233 CPU and 64 MB RAM.
- I/O modules: Choose ADAM-4018/4052/5017/5051D as test module.

The other modules' performace is similar.

Test Result

Units: Seconds

Adam Driver

Blocks*	Points	ADAM-4018	ADAM-4052	ADAM-5017	ADAM-5051D
1	8	0.156	0.06	0.09	0.072
8	64	1.13	0.305	0.301	0.169
16	128	2.19	0.4	0.565	0.307
32	256	4.47	0.626	1.07	0.603
64	512	8.78	1.24	2.12	1.17
128	1024	17.2	2.32	4.22	2.30
256	2048	34.2	4.61	8.36	4.66

Figure 5-31: Adam Module Driver Performance Figures

Summary

GeniDAQ can control the following devices: Advantech I/O hardware, serial port devices and the devices with OPC servers. In addition, GeniDAQ supports the following I/O functions:

- Analog input
- Analog output
- Digital input
- Digital output
- Temperature measurement
- Counter/Frequency measurement/Pulse output
- Alarm
- Serial port communication

6

Historical Trending System

Overview

GeniDAQ provides a historical trending display object that allows you to record past data and then play it back at any time. Up to eight pens can be trended with one historical trending display object and up to 99 historical trending display objects are supported.

Besides scrolling backward and forward, the historical trending display object also allows you to go to a specific time and search for a specific value. You can convert historical data to a text file for subsequent use by other software programs.

Contents

- Creating a historical trend
- Configuring a historical trend
- Going to a specific time with the GoTo button
- Going to a specific value with the Search button
- Converting historical trend data into a text file
- Summary

Note: GeniDAQ CE does not support the Historical Trend function.

Creating a Historical Trend

To create a historical trend:

1. Switch to the Display Designer
2. Select the historical trend display object in the display toolbox.
3. Drag and drop the historical trend object into the Display Designer. The historical trend appears in the window

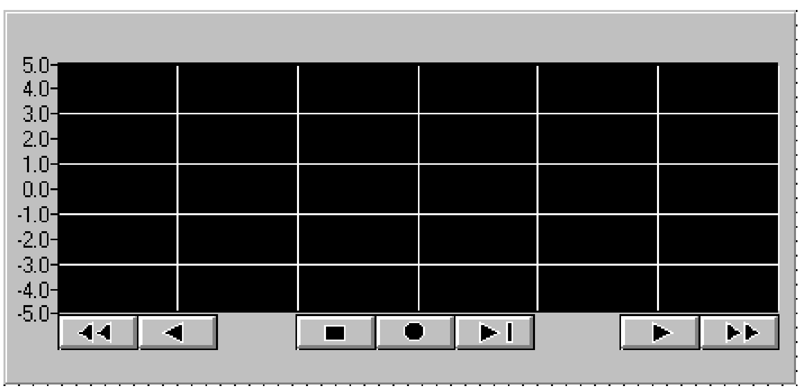


Figure 6-1: Historical Trend Display

The two buttons on the left are:

**Previous Section button**: Push it to scroll the historical data to previous section

**Backward button**: Push it to scroll the historical data back a half page

The two buttons on the right are

**Forward button**: Push it to scroll the historical data forward half a page.

**Next Section button**: Push it to scroll the historical data to next section.

The three buttons in the middle are:

**GoTo button**: Push it to go to a specific time.

**Search button**: Push it to go to a specific value.

**Latest page button**: Push it to go to the latest page.

Note: *A section is a collection of data spanning for a day, or for a duration from the started run time to the stopped point.*

Configuring a Historical Trend

To configure a historical trend:

1. Double-click the trend. The historical trend configuration dialog box appears:

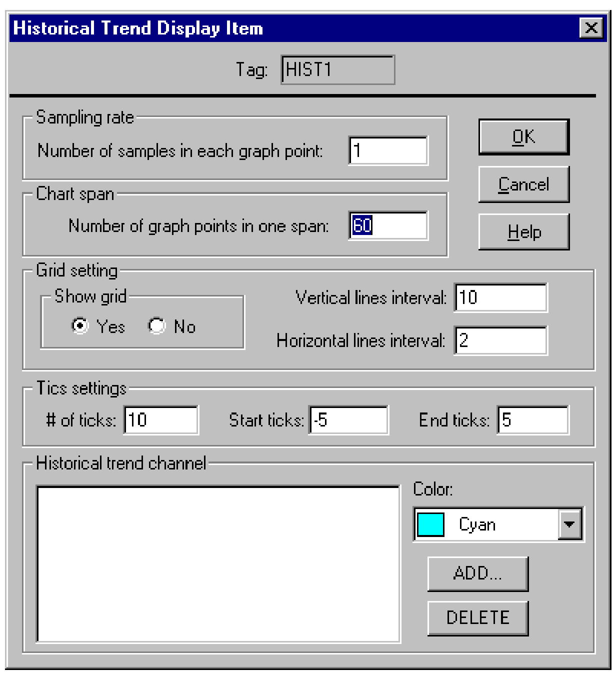


Figure 6-2: Historical Trend Configuration Dialog Box

2. Press the **ADD…** button. The tagname selection dialog box appears. Specify the tagname that you want to use for the trend.
3. Click the **OK** button.

Field Description

- *Number of samples in each graph point*: A divisor similar to the "Update Rate" in many blocks. For each point in the historical trending display, you can specify how many actual strategy samples will pass before the point is displayed.
- *Number of graph points in one span*: Specify the total number of graph points that will be displayed at once.
- *Show grid*: Specify whether to display the grid.
- *Vertical/Horizontal Resolutions*: Specify the number of tick marks between each grid line.
- *# of tics*: Specify the number of tick marks will be displayed for the vertical (Y-axis)
- *Start tics*: Specify the number for the starting tick
- *End tics*: Specify the number for the last tick
- *Historical trend channel*: This field is used to add input data to display its historical values. You can add a new input or delete an existing input. You can also specify the pen color of each data to draw the historical trend.

Going to a Specific Time with GoTo Button

After launching the GeniDAQ runtime, the **Forward** button of the historical trend will be pushed by default. It means that the historical trend draws the traces automatically.

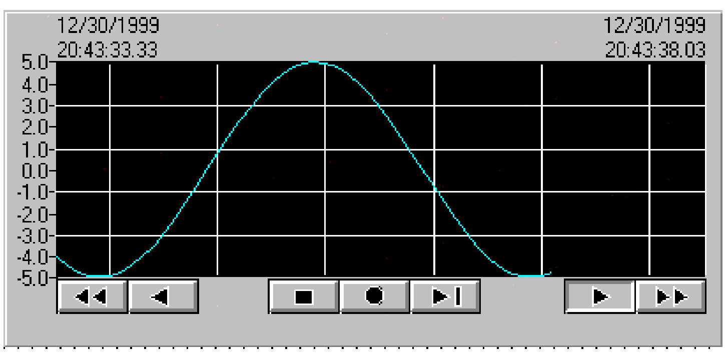


Figure 6-3: The Historical Trend When Running

The starting date and time appears in the top-left corner of the historical trend. The ending date and time is shown in the top-right corner.

You can push the **Backward** or **Previous Section** button to scroll back a half page or previous section. You can also push the **Forward** or **Next Section** button to scroll forward a half page or next section. All of them are toggled.

The **GoTo** button allows you to go to a specific time. When you click the **GoTo** button of the historical trend at runtime, a dialog box appears:

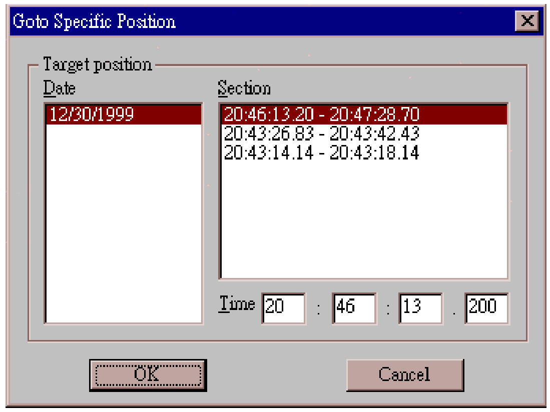


Figure 6-4: Goto Specific Postion Configuration Dialog Box

Select the desired date and time section and then click the **OK** button. The historical trend will go to the position that you specified and show the value on the page.

Searching a Specific Value with the Search Button

The **Search** button allows you to go to a specific value. When you click the **Search** button of the historical trend at runtime, a dialog box appears:

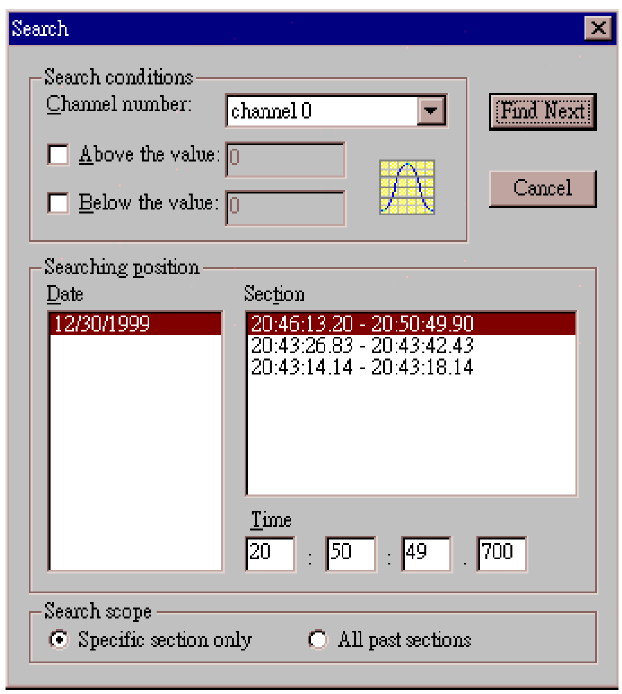


Figure 6-5: Search Configuration Dialog Box

Select the channel number and the values for the searching condition, and then set the *Start Searching Position*, *Date* and *Time* section. GeniDAQ allows you to search a specific section or all past sections by selecting Search scope. Click the **Find Next** button to start searching. Historical trend searches the position that matches the condition from the start searching position. If it finds the matched position, it goes to the position and shows the value on the page.

Converting Historical Trend Data to a Text File

After the acquisition is complete or runtime is stopped, you can convert the historical trend data into a text file.

1. Select **File | HIST Conversion** from the main menu:

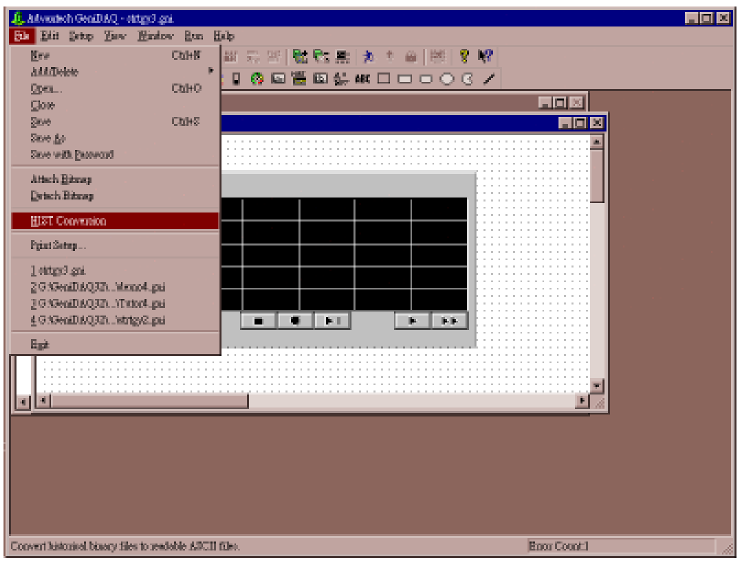


Figure 6-6: Select File | HIST Conversion from the main menu

2. The *Historical Data Conversion* dialog box appears:

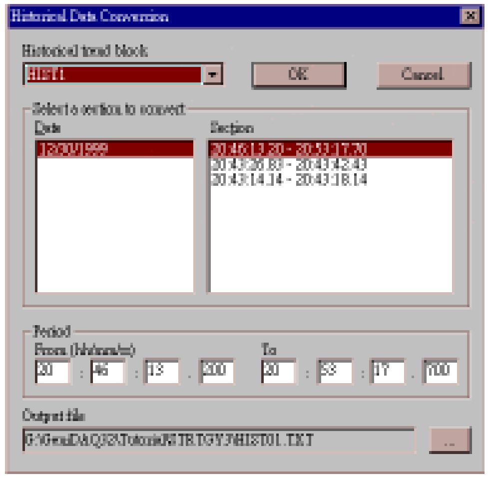


Figure 6-7: Historical Data Conversion Configuration Dialog Box

3. Select the desired historical trend and conversion range, data and time section. Then specify the output file name. Click the **OK** button to start conversion. After the conversion is complete, a message is displayed.

Figure 6-8: Conversion Complete Notification Box

4. You can use Windows Notepad or any other text editor to view the converted file.

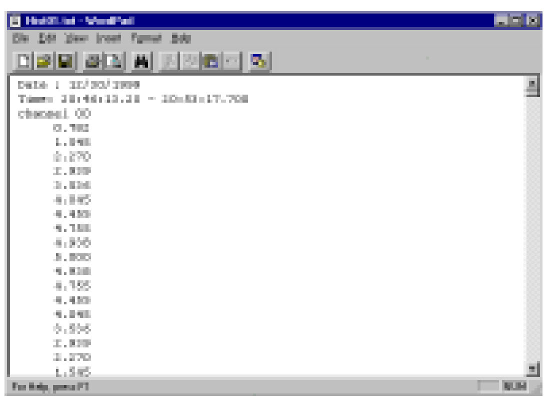


Figure 6-9: Viewing Historical Trend Data in Windows Notepad

***Note**:* *Historical trend keeps the historical data for 30 days by default. You can change it in GeniDAQ.ini file by setting "HistDaysAgo" entry under the [System] section in \Windows directory.*

```
[System]
HistDaysAgo = 30
```

Note: *If you want to keep all historical files, you should set “HistDaysAgo=0”*

Note: *The filename format of the binary file keeping the historical trend data is as follows:*

```
YYYYMMDD.HNN
```

- YYYY: represents the year, for example 2002
- MM: represents the month, for example 10
- DD: represents the date, for example 25
- NN: represents the ordinal number for historical trend, for example, the HIST2 historical trend is represented NN=02.

7

Monitoring Alarm and Event

Overview

GeniDAQ provides an alarm notification feature to inform operators of process and system conditions. This feature supports the display, logging, and printing of process alarms and network and system events. Alarms represent warnings of process conditions, while events represent normal network or system status messages.

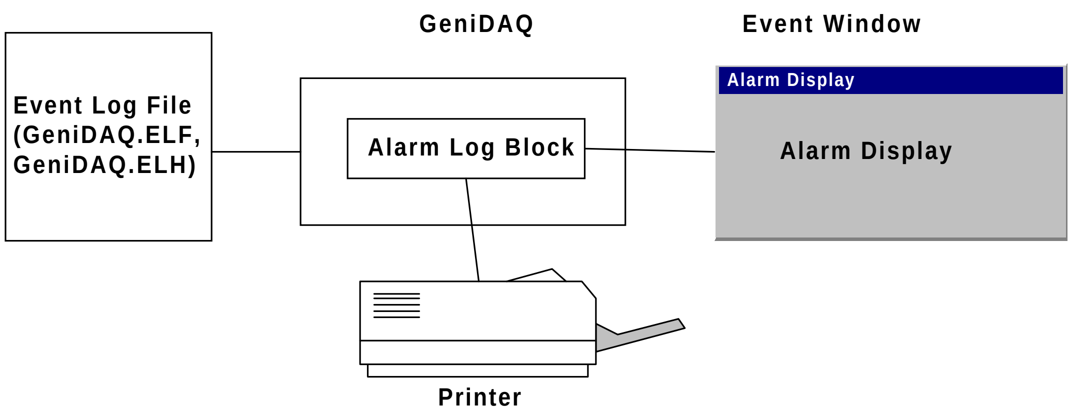


Figure 7-1: The Alarm Log Block Architecture

Contents

- Configuring alarm settings using the *Runtime Preference* configuration dialog box
- Configuring the alarm log block
- Alarm system at runtime
- Summary

Note: *GeniDAQ CE does not support alarm printing.*

Configuring Alarm Settings Under the Runtime Preferences

To enable alarm and event logging and printing, you must check the *Enable Event Log* and *Print Events* in the *Runtime Preference* configuration dialog box. You can open this dialog box by choosing **Setup | Runtime Preference…** from the main menu.

Figure 7-2: Runtime Preference Configuration Dialog Box

Configuring the Alarm Log Block

To configure alarm limits for a signal, you must use an alarm block to set the alarm limits and check the alarm. Place an Alarm Log icon on the Task Designer configuration window and right-click the icon. The *Alarm Log Block* configuration dialog box opens:

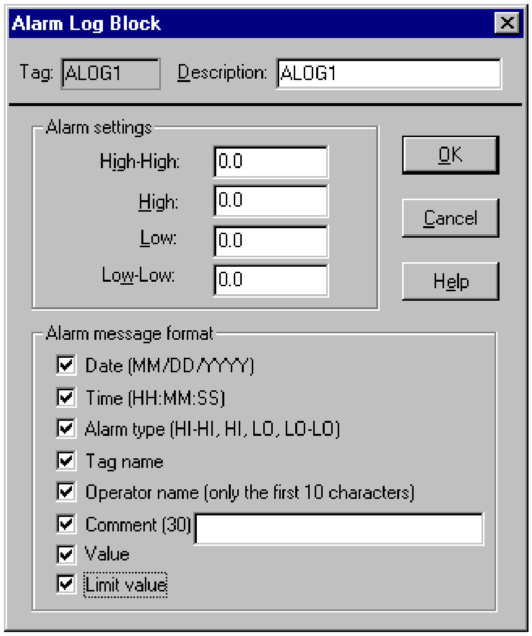


Figure 7-3: Alarm Log Block Configuration Dialog Box

This block has input and output capability. The block allows Alarm data from inputs to be logged to the GeniDAQ Event Log File (\GENIDAQ\GENIDAQ.ELF). This data can also be displayed and acknowledged during runtime via the *Event Log Viewer* when the input data falls within the following regions:

1. If the input data is above the *High-High* value
2. If the data is between the *High* and *High-High* value
3. If the data is between the *High* and *Low* value
4. If the data is between the *Low* and *Low-Low* value
5. If the data is below the *Low-Low* value

The block also outputs a value depending on what data is seen by the block. This value can be fed to one of the conditional display items to show the state of the alarm. For the following regions (regions annotated above):

1. The block outputs a four (4)
2. The block outputs a two (2)
3. The block outputs a zero (0)
4. The block outputs a one (1)
5. The block outputs a three (3)

While the strategy is running, alarms may be acknowledged by double-clicking on the *Alarm Log Event* (ALOG1 HI, etc.). Alarms will be in the color red until acknowledged. For the *Event Log* dialog box to appear during Runtime, you must enable it via the *View* menu.

- *Wiring In*: The block accepts input data and logs to the GeniDAQ Event Log File (\GENIDAQ\GENIDAQ.ELF). Input data can also be displayed and acknowledged during runtime via the Event Log Viewer.
- *Wiring Out*: The block forwards input values to connected block(s).

Alarm System at Runtime

After launching the GeniDAQ runtime, all alarms and events will be shown in *Event Log* window and can be printed out.

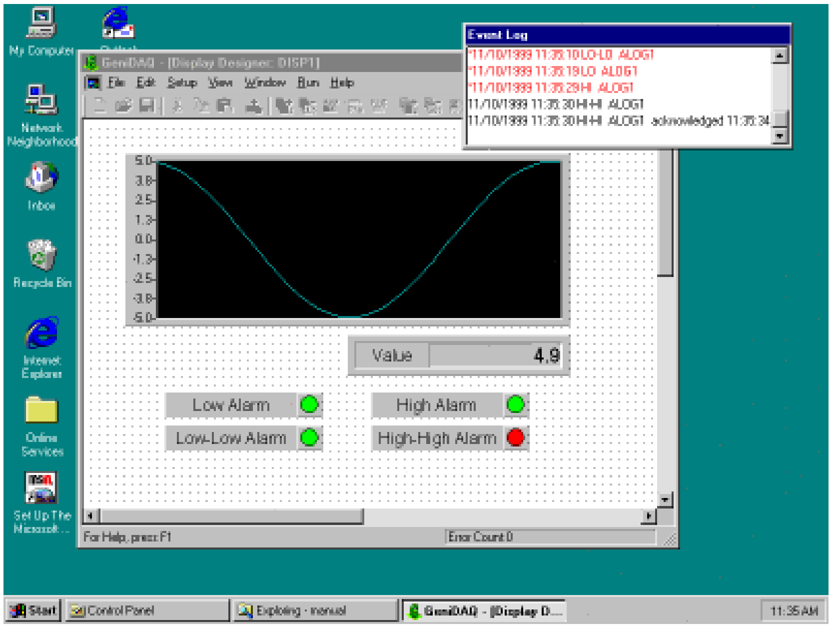
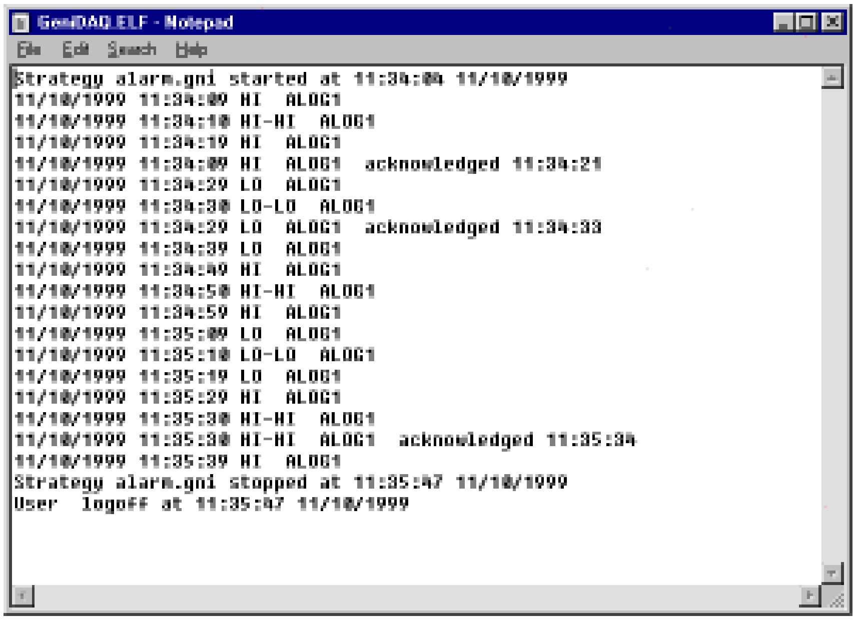


Figure 7-4: The Alarm System at Runtime

You can double-click on any alarm entry to acknowledge the message. The message's color will change from red to black and an acknowledgement message will appear in the window.

The alarm message will be logged into the file genidaq.elf and genidaq.elh which are saved in your project directory. The genidaq.elf file stores the current messages and genidaq.elh file stores the histori-cal messages. When the alarm messages exceed 100 entries in genidaq.elf, GeniDAQ will copy them into genidaq.elh during the next run. Both files are ASCII format. You can view them in NOTEPAD.EXE.




```
Strategy alarm.gni started at 11:34:04 11/10/1999
11/10/1999 11:34:09 HI   ALOG1
11/10/1999 11:34:10 HI-HI   ALOG1
11/10/1999 11:34:19 HI   ALOG1
11/10/1999 11:34:09 HI   ALOG1  acknowledged 11:34:21
11/10/1999 11:34:29 LO   ALOG1
11/10/1999 11:34:30 LO-LO   ALOG1
11/10/1999 11:34:29 LO   ALOG1  acknowledged 11:34:33
11/10/1999 11:34:39 LO   ALOG1
11/10/1999 11:34:49 HI   ALOG1
11/10/1999 11:34:50 HI-HI   ALOG1
11/10/1999 11:34:59 HI   ALOG1
11/10/1999 11:35:09 LO   ALOG1
11/10/1999 11:35:10 LO-LO   ALOG1
11/10/1999 11:35:19 LO   ALOG1
11/10/1999 11:35:29 HI   ALOG1
11/10/1999 11:35:30 HI-HI   ALOG1
11/10/1999 11:35:30 HI-HI   ALOG1  acknowledged 11:35:34
11/10/1999 11:35:39 HI   ALOG1
Strategy alarm.gni stopped at 11:35:47 11/10/1999
User  logoff at 11:35:47 11/10/1999
```

Figure 7-5: Viewing the Log File in Windows Notepad

Summary

The Alarm Log Event provides comprehensive logging for your running strategy. In addition to providing real-time information and statistics, log files can be saved to provide a historical record of what happened during the strategy.

8

Communicating Through TCP/IP Networking

Overview

GeniDAQ is designed to support both stand-alone and small-scale networked applications. All nodes can share data with each other. For example, you can install individual I/O servers on each node to avoid I/O server loading and increase overall performance.

GeniDAQ uses TCP/IP to provide connectivity for GeniDAQ nodes. Microsoft's TCP/IP is available for Windows NT and Windows 95/98 nodes, and is built into both of these operation systems.

Contents

- Network Architecture
- Configuring IP addresses and node names for remote nodes
- Configuring network input blocks to map remote tags
- Enabling event log to check network messages
- TCP/IP Setup in Windows 98/95
- TCP/IP Setup in Windows NT
- Troubleshooting
- Summary

Network Architecture

The GeniDAQ provides a simple client-based architecture for small-scale network configuration. You only have to specify the remote tags that you wish on the client-site node. You do not need to make any settings on the server-site node. Then client-site node will request data from the server node automatically. Each node has its own GeniDAQ application or strategy.

The network architecture is shown in the following diagram:

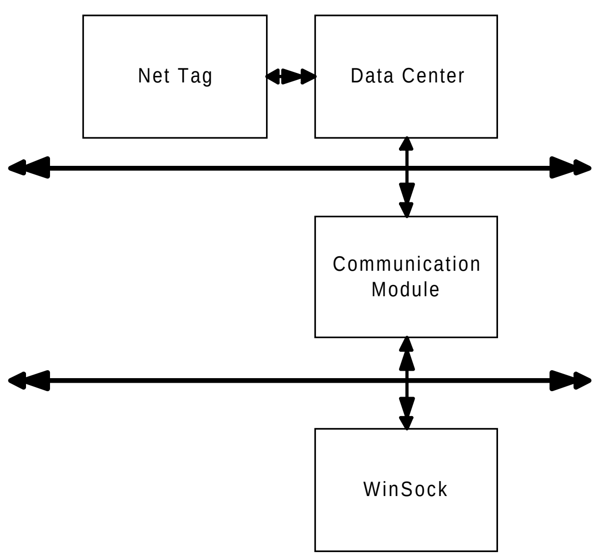


Figure 8-1: GeniDAQ Network Architecture

For configuring TCP/IP in Windows 95/98 and Windows NT, please refer to the sections *Setup TCP/IP in Windows 95/98* and *Setup TCP/IP in Windows NT*.

Configure IP Addresses and Node Names on Client Site

After you configure the TCP/IP settings for the local node in the Control Panel, you should configure the IP address of remote nodes to connect them on client site. By pressing the **Settings** button in the Networking Setting dialog box under the GeniDAQ's **Setup | Network** menu, the Remote Node Settings dialog box appears. GeniDAQ allows you to map an IP address to a text name for easy identification. The local node name and remote node names must be mapped to unique IP addresses.

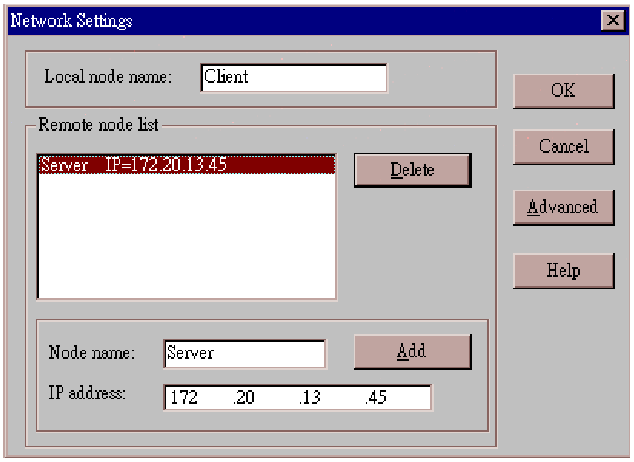


Figure 8-2: Network Settings Configuration Dialog Box

Field Description

- *Local node name*: Specifies the local client site name.
- *Node name*: Specifies the remote server name.
- *IP address*: Specifies the IP address of the remote server name.
- *Add button:* After specifying Node name/IP address, press Add button to add a node into Remote node list.
- *Delete button*: Select an item in the Remote node list, then press the Delete button to delete it.

You can press the Advanced button to adjust the parameters for network communication, the Advanced Option dialog box appears.

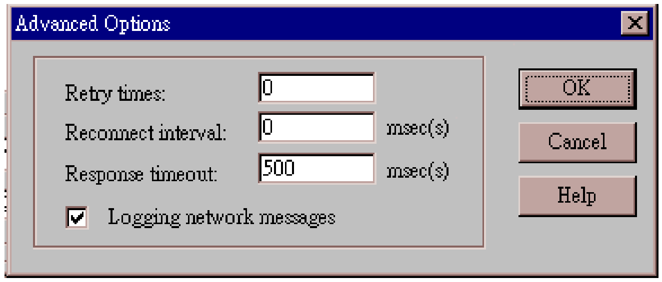


Figure 8-3: Network's Advanced Option Dialog Box

Field Description

- *Retry times*: After connection, if a network block cannot get any data from a remote node after N number of retries, the network block shows a timeout in the status bar. A zero (0) entry in the text box indicates that as many attempts as are necessary will be made for network connection. Any other integer in the text box will allow for connection attempts to stop after N number of tries.
- *Reconnect interval*: Specifies time interval for reconnection in milliseconds.
- *Response timeout*: Specifies time out for response in milliseconds.
- *Logging network messages*: Enables logging of communication messages in the event window.

Configuring Network Input Blocks to Map Remote Tags

Block Information

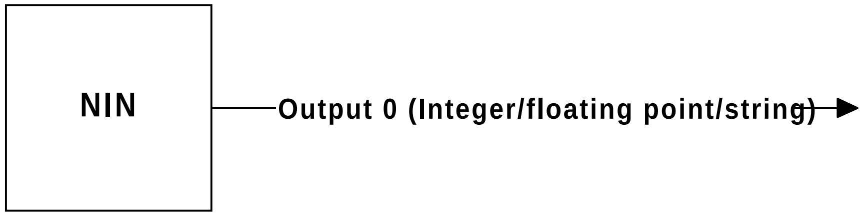


Figure 8-4: Network Input Block Information Diagram

Interface

- Number of inputs: 0
- Input type: none
- Number of outputs: 1
- Output type: integer, floating point or string

Description

This block has output capability that supplies other blocks with remote data from the network. Network input block specifies the remote tag and data type.

Dialog Box Configuration

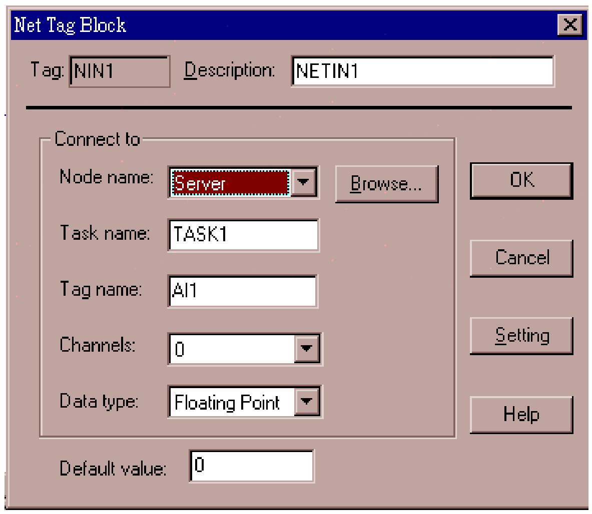


Figure 8-5: Net Tag Block Configuration Dialog Box

Field Description

- *Node name*: Specifies the remote server name. It is configured in the *Network Settings* dialog box.
- *Task name/Tag name/Channels*: Specifies the tag on the remote server node.
- *Data type*: Specifies the data type of the tag. The option includes floating point, integer and string. Make sure that the data type matches with that of the remote tag.
- *Default value*: Specifies the value when disconnecting.

If the remote server is running, GeniDAQ allows you to configure the tag on-line. Press the Browse button, a dialog box appears.

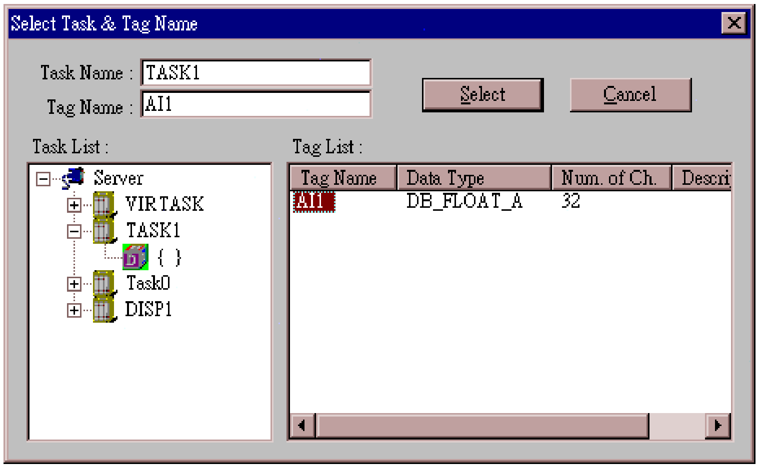


Figure 8-6: Select Task & Tag Name Configuration Dialog Box

You click the desired task on the Task List field and the desired tag in the Tag List. Then the resulted tag is shown in the Task Name and Tag Name fields.

Enabling Event Log to Check Network Messages

You can enable the event log to check network communication status by enabling the event log option in the *Runtime Preference* under the **Setup** menu. You can then run it and check the network messages in the event window as follows:

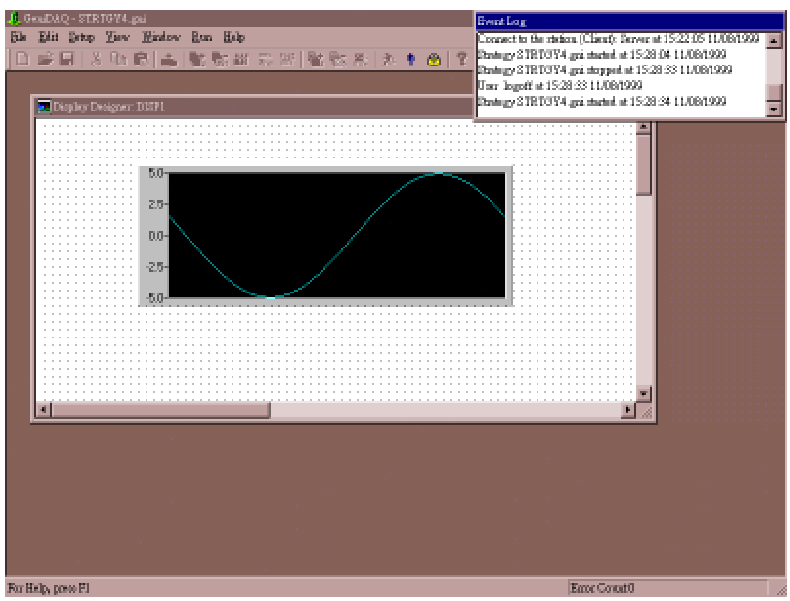


Figure 8-7: Running Strategy Showing Network Messages

Setup TCP/IP in Windows 98/95

This section provides supplemental instructions for configuring Microsoft TCP/IP. Follow these steps to set up this configuration on Windows 95.

Note: *Have the Windows 95 disks or CD-ROM available. You may need them at the end of this procedure.*

1. Access the Windows 95 Control Panel and double-click the Network icon. The Network dialog box appears as below.

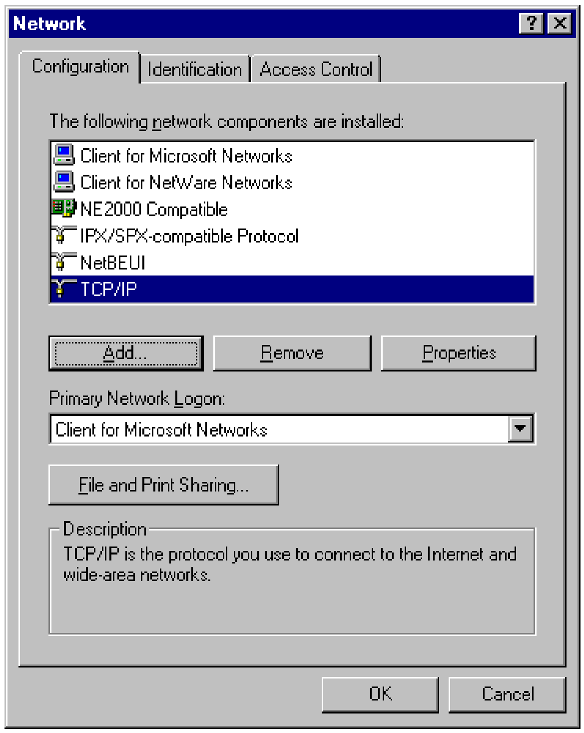


Figure 8-8: Network Configuration Dialog Box for Windows 98/95

2. Verify that the following are installed by checking if they are listed in the installed components list box

Network adapter driver that matches your installed network adapter hardware

TCP/IP Protocol

If both of the above network components are installed, skip to step 9 of this procedure

3. If a driver for your network adapter is not currently installed, click the Add button and select Adapter from the network component list box of the **Select Network Component Type** dialog box.

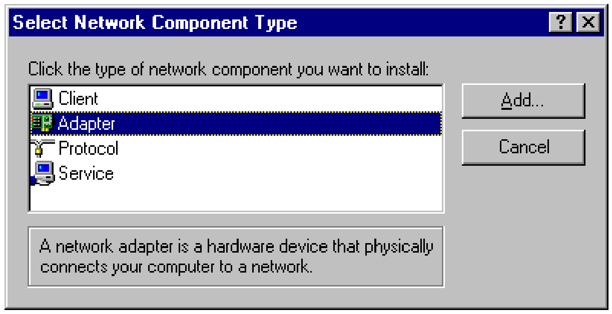


Figure 8-9:Windows Select Network Component Type Configuration Dialog Box

4. Click Add, and the Select Network Adapters dialog box appears.

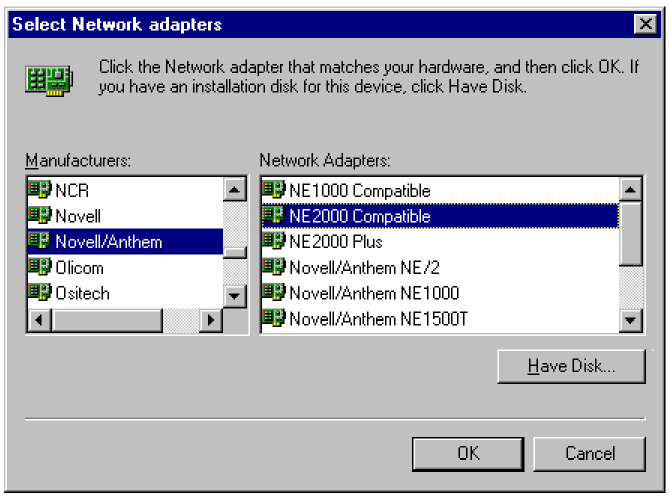


Figure 8-10: Windows Select Network Adapters Configuration Dialog Box

5. Select the manufacturer of your network adapter from the *Manufacturers* list box, and then select your network adapter type from the *Network Adapters* list box. When finished, click OK to install the driver for your network adapter.

6. If the TCP/IP Protocol is not installed, click the Add button and select Protocol from the Select Network Component Type dialog box. The Select Network Protocol dialog box appears.

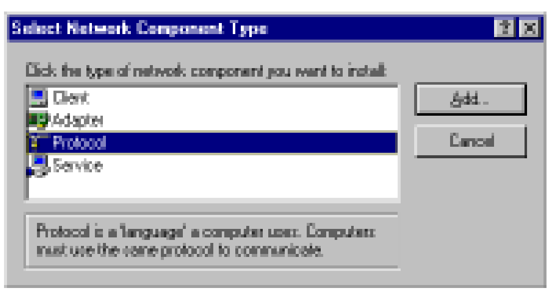


Figure 8-11: Select Network Component Type Configuration Dialog Box

7. The Select Protocol dialog box appears. Select Microsoft from the Manufacturers list box, and then select TCP/IP from the Network Protocols list box. When finished, click OK to install Microsoft TCP/IP.

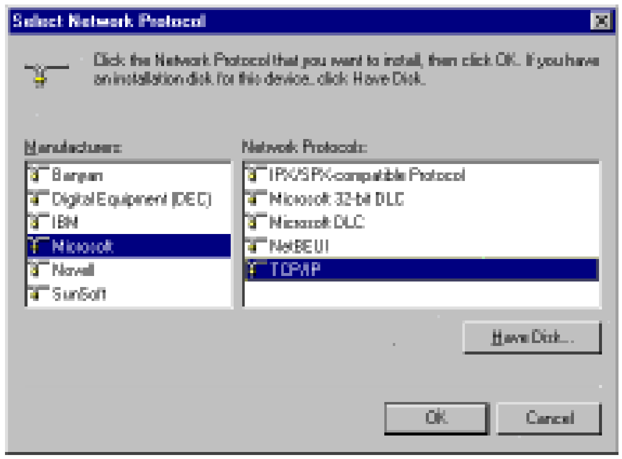


Figure 8-12: Windows Select Network Protocol Configuration Dialog Box

8. Select TCP/IP from the installed network components list box and click the Properties button. The TCP/IP Properties dialog box appears, as shown below.

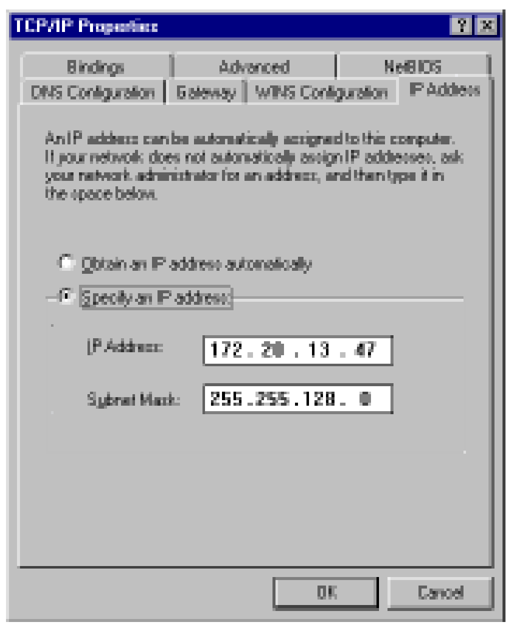


Figure 8-13: TCP/IP Properties Configuration Dialog for Windows 98/95

9. Select the IP Address tab. Enter your IP address and Subnet Mask into their respective fields. Ask your network administrator for these values. Once you have entered these values, click OK. Do not select the Obtain an IP address automatically checkbox.

Note: You can also select the Obtain an IP Address automatically option. If you enable the option, you can issue a “ping Computer Name” command under a DOS prompt to get the address.

10. Click OK to save your changes and exit the Network Control panel. Restart the computer. The computer is now ready to run GeniDAQ over the TCP/IP protocol.

Setup TCP/IP in Windows NT

This section provides supplemental instructions for configuring Microsoft TCP/IP. Follow these steps to set up this configuration on Windows NT.

Note: Have the Windows NT disks or CD-ROM available. You may need them at the end of this procedure

1. Access the Windows NT Control Panel and double-click the Network icon.
2. Verify that the following are installed by checking if they are listed in the installed components list box

Network adapter driver that matches your installed network adapter hardware

TCP/IP Protocol

If both of the above network components are installed, skip to step 8 of this procedure

3. If a driver for your network adapter is not currently installed, select the Adapters tab and click Add button from the Network dialog box.

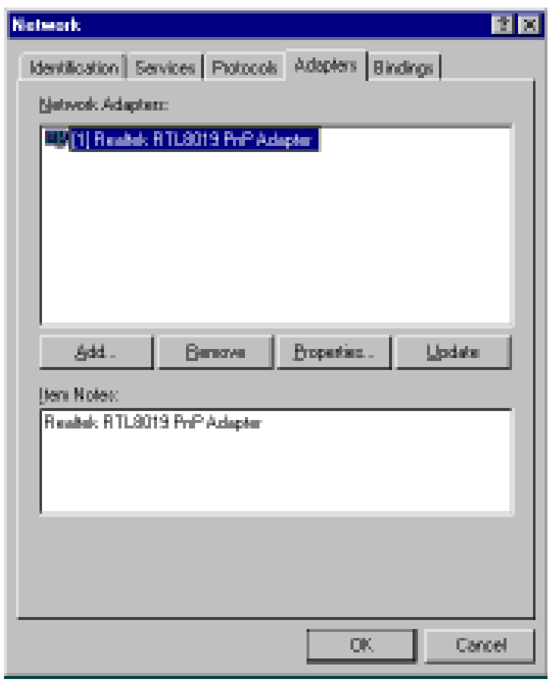


Figure 8-14: Network Adapter Listing Dialog Box

4. The Select Network Adapter dialog box appears. Select the manufacturer of your network adapter from the Manufacturers list box, and then select your network adapter type from the Network Adapter list box. When finished, click OK to install the driver for your network adapter.

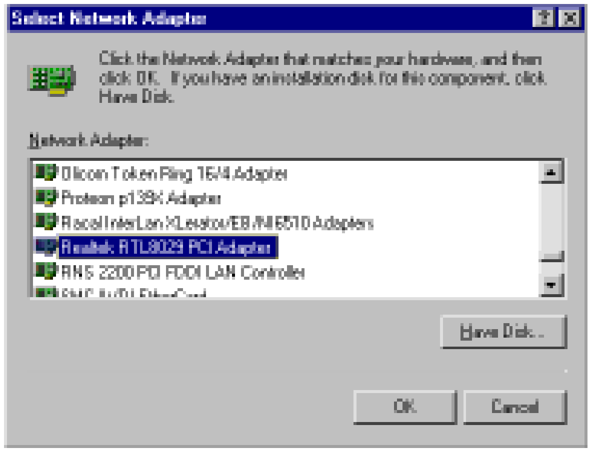


Figure 8-15: Select Network Adapter Configuration Dialog Box

5. If the TCP/IP Protocol is not installed, select the Protocol tab and click the Add button.

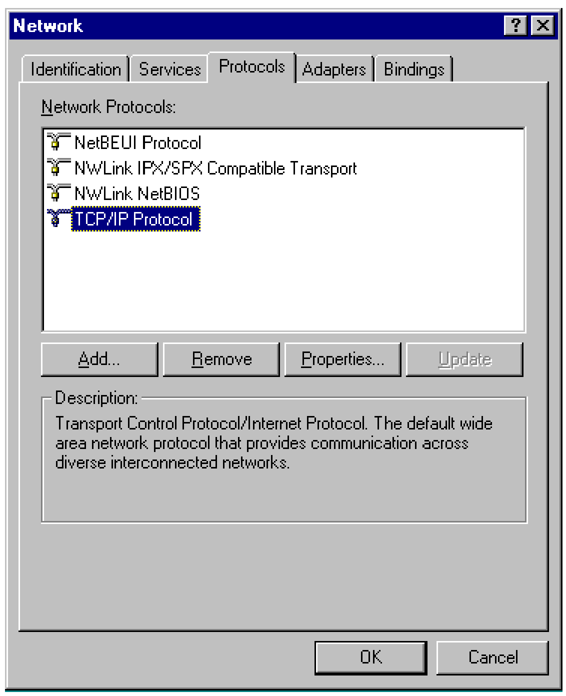


Figure 8-16: Network Protocols Listing Dialog Box

6. The Select Network Protocol dialog box appears. Select TCP/IP Protocol from the Network Protocol list box. When finished, click OK to install TCP/IP Protocol.

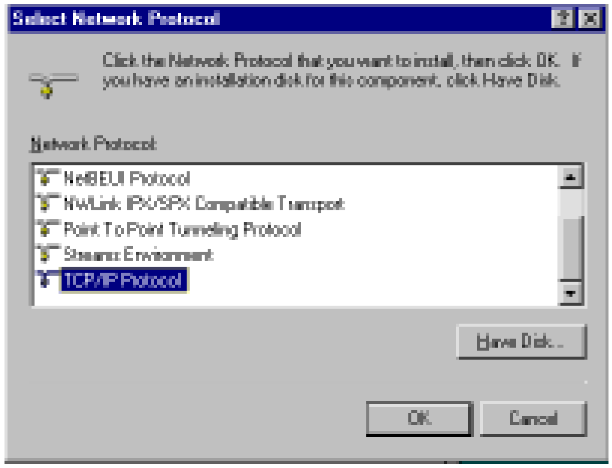


Figure 8-17: Network Protocol Configuration Dialog Box

7. Select TCP/IP Protocol from the Protocol tab and click the Properties button. The TCP/IP Properties dialog box appears, as shown below.

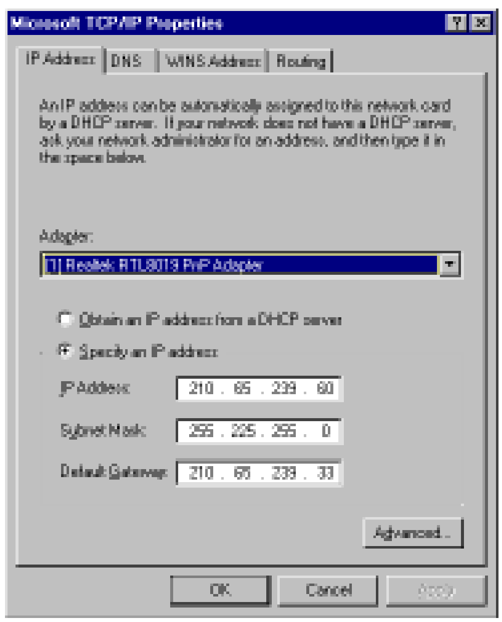


Figure 8-18: TCP/IP Properties Configuration Dialog Box

8. Select the IP Address tab. Choose the Specify an IP address checkbox and enter your IP address, Subnet Mask, and Default Gateway into their respective fields. Ask your network administrator for these values. Once you have entered these values, click OK. You can also select *Obtain an IP address from a DHCP server*.

Note: If you enable the option, you can issue an "ipconfig" command under a DOS prompt to get the address.

9. Click OK to save your changes and exit the Network Control panel. Restart the computer. The computer is now ready to run GeniDAQ over the TCP/IP protocol.

Troubleshooting

If the nodes cannot communicate with each other, you can check the following:

1. To test remote access using Ping:
   a. Use ping or ipconfig to get the server's IP address on the server node
   b. Issue ping with the IP address of the server node on the client node. The remote node should respond immediately.
   c. If ping fails, please check your network settings.
2. Note if the nodes communicate with other nodes located on different networks, you should use DNS (Domain Name System) for name resolution.
3. Network port is 700 by default. You can change it in GeniDAQ.ini file by setting "NetworkPort" entry under the [System] section in \Windows directory.

```
[System]
NetworkPort = 700
```

If the network port is used by another applications, you have to change it to another value.

Note: Any number of network input blocks can be used at one time, limited only by your system's speed and memory. It is suggested that the number of network input blocks should not exceed 256/per node. In addition, each node should not connect to more than 16 nodes.

Summary

GeniDAQ's network supports TCP/IP protocol and the following data types: integer, floating point, and string. Each GeniDAQ node can be as client or/and server node. In addition, GeniDAQ provides network message logging and monitoring

9

Runtime and Security System

Overview

GeniDAQ Runtime (GeniRUN.EXE) takes advantage of the Windows operating system to provide a real-time, multi-tasking environment that combines the logical flow of a previously defined strategy with any number of Display objects in the Operator Panel. Runtime executes your strategy in real-time, based upon data received from I/O devices or by manual operator entry. Through GeniDAQ Runtime, the process can be monitored and controlled, data can be logged to a disk, replayed, and manipulated. GeniDAQ Runtime only provides runtime function. However, GeniDAQ builder (GeniDAQ.EXE) provides editing and runtime environment for developing and testing your strategies.

In order to avoid unintentional or unauthorized operations which may affect system stability, GeniDAQ security system provides privilege control and password protection. Password protection offers built-in log-on with up to 255 levels of assignable access, providing extension control for password access and conditional operations.

Contents

Working with GeniDAQ Runtime

Configuring Runtime properties

Configuring password security

Log-in and Log-off at runtime

Working with display control object at runtime

Working with GeniDAQ Runtime

The GeniDAQ Runtime system behaves in different ways, depending on the choices made by the designer who created the strategy and corresponding displays. Its overall behavior is determined by the way Task Designer blocks have been arranged and connected, in conjunction with the Scan Period(s) set in the Setup/Tasks menu. If the Display has been designed with output capability (i.e., buttons, numeric displays that can be edited, etc.), the associated parameters can be changed during GeniDAQ Runtime. During GeniDAQ Runtime, commands and data can be entered using either the keyboard or the mouse.

Runtime Environment

The GeniDAQ Runtime environment is shown below:

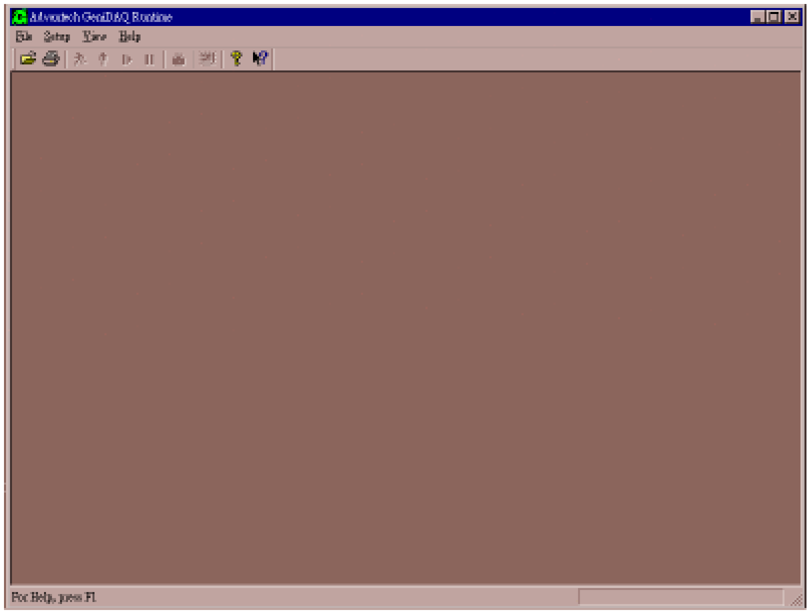


Figure 9-1: GeniDAQ Runtime Environment

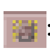
: Start icon to start running the strategy.

: Stop icon to stop the running strategy.

: Pause icon to pause the running strategy.

: Resume icon to resume the paused strategy.

: Lock icon to lock the strategy.

: Refresh icon to refresh the screen.

To display or hide the Status Bar at the bottom of the Runtime screen, highlight the View/Status Bar command with your mouse. The Status Bar allows you to get quick, concise help on menu commands. As you highlight a menu item with your mouse, you can view information on the item in the status bar at the bottom of the runtime window. During runtime, status information is displayed such as any errors that have occurred, or whether the strategy is running normally. Errors generally include hardware driver errors or errors due to timing problems. The error codes are listed in the Appendix under Runtime Error Code Listing.

Starting Runtime

Starting the GeniDAQ Runtime session is performed from the following methods:

1. Enter the Advantech GeniDAQ 4.0 folder, and double-click on the GeniDAQ Runtime icon. Open the desired strategy file with the suffix ".gni", and press START on the GeniDAQ Runtime Menu Bar.
2. Create a new icon with "GeniRUN" <strategy> as the command line in the startup group if you want

the strategy to be loaded and started upon running when Windows is startup.

3. You can also create a new icon with “GeniRUN <strategy>” as the command line. This will cause the strategy to be loaded and started upon running.

Exiting Runtime

When you have finished working in Runtime, exiting back to Windows is performed by pressing the STOP menu item on the Runtime menu bar. After you stop the runtime system, you can either restart by pressing start, or you can exit the GeniDAQ Runtime system by entering the File menu and pressing Exit.

Configuring Runtime Properties

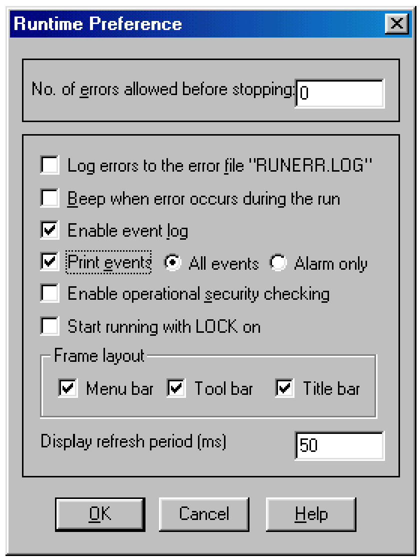


Figure 9-2: Runtime Preference Configuration Dialog Box

Runtime Preference...

The *Runtime Preference* dialog box is used to configure the runtime properties of a strategy. In GeniDAQ you can specify how many errors will be allowed to occur before runtime will stop because of excessive errors. A runtime error is an error that usually occurs as a result of improper settings within GeniDAQ, or because of hardware problems. A list of runtime errors is included in the appendix of this manual. Acceptable values for *No. of errors allowed before stopping* are between 0 and 32767.

In addition to the *No. of errors allowed before stopping* item, you can enable/disable the following blocks to invoke the related functions during strategy execution.

Log errors to the error file “RUNERR.LOG”

If this item is enabled, runtime errors are logged to the file “RUNERR.LOG”. The “RUNERR.LOG” file is created in the GeniDAQ directory. The shortcut word is “f” or “F”. You can press “Alt+f” or “Alt+F” to enable/disable this option.

Beep when error occurs during the run

If the item is enabled, the GeniDAQ workstation will generate a beep sound when an error occurs during runtime. The shortcut word is “b” or “B”. You can press “Alt+b” or “Alt+B” to enable/disable this option.

Enable Event Log

If this item is enabled, GeniDAQ events that occur will be written to the event log files “GENIDAQ.ELF” (first 100 events) and “GENIDAQ.ELH” (remaining events). Except log files, the *Event Log Viewer/Alarm Acknowledgment Dialog Box* can be displayed during runtime to reflect the event log information. GeniDAQ events consist of:

1. The start and stop time/date of the strategy
2. If in secure mode (password has been enabled by checking “Enable Password Checking”), password user ID/time of day will be logged when user logs in or out.
3. Alarm information and acknowledgment if Alarm Log Block has been connected.

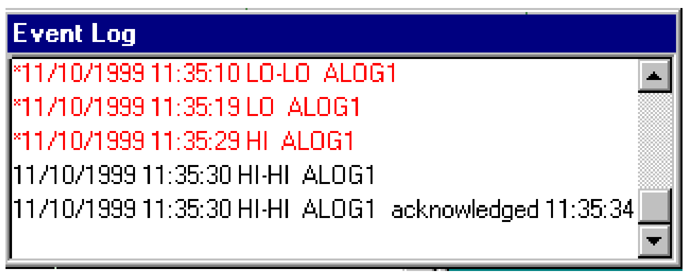


Figure 9-3: Event Log Viewer/Alarm Acknowledgment dialog box

Event Log Viewer/Alarm Acknowledgment Dialog Box

This item can be invoked by selecting **Event Log** from the **View** menu while the strategy is running. If you want to hide this dialog box, click on the *Event Log* menu option again and the dialog box will disappear.

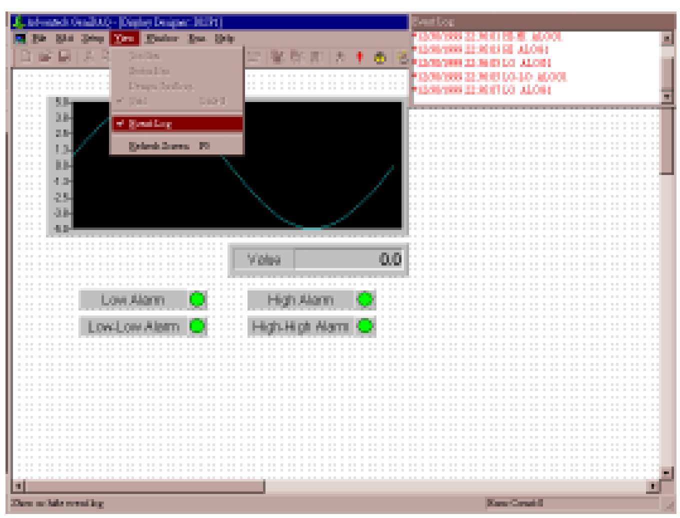


Figure 9-4: Invoke Event Log option

While the strategy is running, alarms may be acknowledged by double-clicking on the Alarm Log Event (ALOG1.HI, etc.). Alarms will be in the color red until acknowledged.

The shortcut word is “l” or “L”. You can press “Alt+l” or “Alt+L” to enable/disable this option.

Print events

After you enable the *Event Log* option, this *Print events* option will be activated and you can enable/disable it. If you enable the *Print events* option, you can select to print all GeniDAQ events that occur or alarm events only. This enabled setting will output events immediately to the connected printer. This provides real-time event printing. The shortcut word is “e” or “E”. You can press “Alt+e” or “Alt+E” to enable/disable this option.

Enable Operational Security Checking

Before selecting the *Enable Operational Security checking* option, you are advised to add users and passwords in GeniDAQ system using the **Administration...** function. If *Enable Password Checking* is selected, GeniDAQ will request you to key in a user ID and password when you start to run a strategy or unlock a locked strategy while it is in runtime. The shortcut key is “p” or “P”. You can press “Alt+p” or “Alt+P” to enable/disable this option.

Figure 9-5: Login User ID and Password

Start running with LOCK on

If this option is enabled, GeniDAQ will lock the screen when you start to run a strategy. You have to key in user ID and password to unlock it if the “Enable Password Checking” option is enabled. If the “Enable Password Checking” option is disabled, you can press “ESC” to unlock the screen. This option is used for system security. There is no shortcut for this option.

Frame layout

Frame layout option is used to set up the display layout while it is in runtime. There are three options: Menu bar, Tool bar and Title bar. You can enable/disable these three items, as you want.

Display refresh period

Display refresh period is used to specify the period to refresh the screen in millisecond.

Configuring Password Security

To enter a password that gives you access to GeniDAQ Builder's configuration settings, complete the following procedure.

Administration

1. Select **Setup | Administration** from the GeniDAQ main menu. Enter a password in the input box. When GeniDAQ is started for the first time, the Supervisor Password is blank. Once a Supervisor Password is entered by using the Setup/Change Password dialog Box, the Supervisor Password stays in effect unless changed.

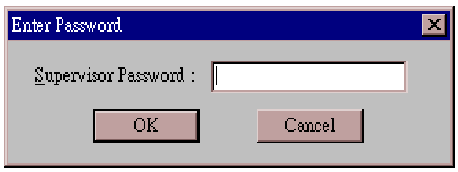


Figure 9-6: Password Configuration Dialog Box

Note: *If the Supervisor Password has been inadvertently forgotten, you may start fresh by deleting the SECURITY.PW file located in the GeniDAQ directory.*

Note: *To enable password security for GeniDAQ CE Runtime, you have to download the SECURITY.PW file located in the GeniDAQ directory to \harddisk\genidaqce directory on the HMI-640S via the ActiveSync utility. For more inforomation about using ActiveSync, please refer to chapter 12.*

To create a new user account for the GeniDAQ Builder console, do the following:

1. Enter the new *User ID* and *Password* in the *Users Administration* configuration dialog box. The *User ID* and password can consist of as little as no characters, for which simply pressing the ESC key will unlock the strategy. The *User ID* and *Password* can contain up to 16 characters or spaces, with no constraints on format.
2. Specify the *Privilege* number of each User. The privilege is used to manage security of the system. You can design your system, display window and control object with privilege constraints to lock and protect user options. The privilege number is from 1 to 255. The larger number, the higher one's level of privilege to access the display window and control objects. The privelege number '-1' is reserved for the supervisor.
3. Click the **Add User** button.

To delete a user account from the GeniDAQ Builder console:

1. Highlight the *User ID* that you want to remove in the *User List* pane and then click the **Delete** button.

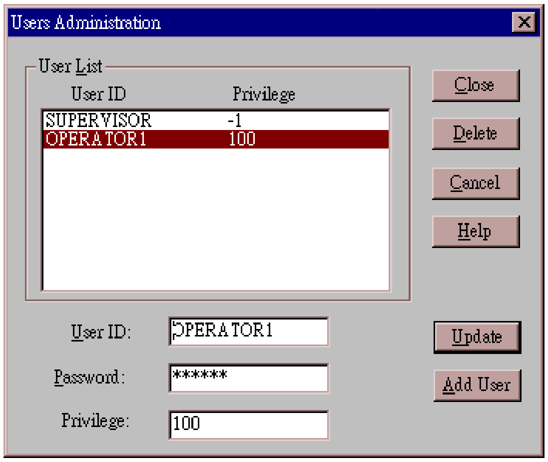


Figure 9-7: Users Administration Configuration Dialog Box

Change Password

To change the GeniDAQ Builder password, do the following:

1. Select **Setup | Change Password** from the main menu.
2. The *Change Password* configuration dialog box opens. Enter the *User ID* whose password you want to change, the *Old Password* and the *New Password*.
3. Click the **OK** button to save your changes.

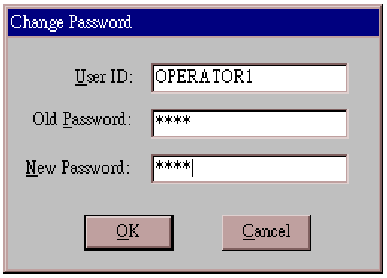


Figure 9-8: Change Password Configuration Dialog Box

If you want *GeniDAQ Runtime* to check for a password, you must enable this feature in the *Runtime Preferences* configuration dialog box. Select **Setup | Runtime Preference** to display this dialog box:

Figure 9-9: Runtime Preference Configuration Dialog Box

Log-in and Log-off at Runtime

If you enable the *Starting running with LOCK on* option, GeniDAQ will lock the screen when you start to run a strategy. You have to press “ESC” key to unlock the screen.

If you enable password checking option, GeniDAQ will request you to key in a user ID and password when you start to run a strategy or unlock a locked strategy while it is in runtime.

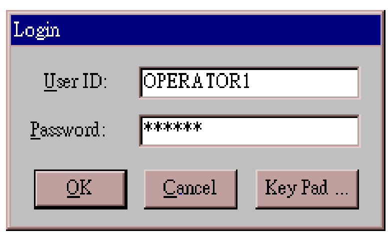


Figure 9-10: Login Dialog Box

If your system doesn’t support a keyboard, GeniDAQ provides a software keypad to input user ID and password.

Note: *GeniDAQ version 4.1 also support software keypad for Numeric Control system for Windows 98/NT. You can enable it by setting NumericKeypad = 1 in \Windows\GeniDAQ.ini file*

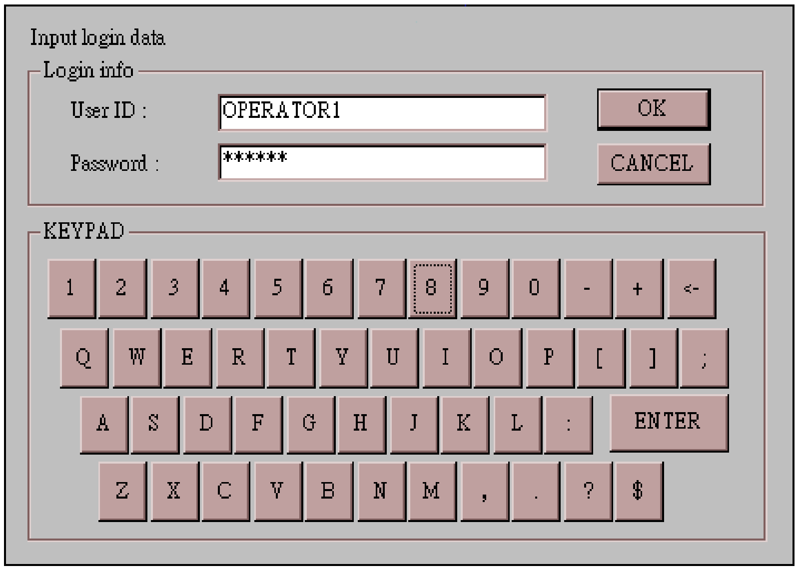


Figure 9-11: GeniDAQ Screen Keypad

Working With Display Control Object at Runtime

In order to avoid unintentional or unauthorized operations which may affect system stability, GeniDAQ provides privilege control for display control objects, including binary button, menu button, conditional button, numeric control, knob and slider control. The privilege level is from 0 to 255, with the larger number having a higher privilege. For example, if the privilege level of a button is 100, then a user's privilege must be larger than or equal to 100 to press this button. Please refer to display control objects in *Chapter 4, Configuring Your Display View with Display Designer*.

10

Advanced BasicScript Programming for Your Specific Needs

Overview

Script designer is essentially a text editor with smart features for editing script code. The script code will be compiled into p-code after editing so it will not need to be compiled again at run-time. The syntax of BasicScript is like as Microsoft VBA (Visual Basic for Application in Excel, Word, Access, etc.) and Microsoft Visual Basic. BasicScript source code and be compiled and executed in Script designer without any modifications, provided that only common functions are used. Script designer supports the cut, copy and paste functions, just like the VBA development environment.

The BasicScript macro editor/debugger provides a complete environment for editing and debugging macro code. It supports advanced debugging capabilities including the ability to step and trace code, set break points and debug variables, structures and arrays. You can debug your complicated code in the editor before run-time.

The Script designer can be used for editing the main script and other task scripts. The main script controls the operation of the entire system, including staring a task, stopping a task and switching to the desired startup display. The task script is used to take of actions before and after executing tasks, for example, initializing and resetting the values. In addition, BasicScript block is used to calculate and analyze real-time I/O data in each task scan. GeniDAQ provides a variety of commands to process real-time I/O data.

Note: GeniDAQ CE does not support BasicScript.

Contents

- Familiar with Script designer
- Editing your scripts
- Running your scripts
- Debugging your scripts
- Programming with GeniDAQ
- BasicScript GeniDAQ commands
- Summary

Script Designer Basics

This section provides general information that will help you work most effectively with Script Designer. It includes an overview of Script Designer's application window—the interface you'll use to edit, run, and debug your BasicScript scripts—as well as lists of keyboard shortcuts and information on using the Help system.

Toolbar

The following list briefly explains the purpose of each of the tools on Script Designer's toolbar. These tools are discussed in more detail later in the chapter, in the context of the procedures in which they are used.

- Tool: Function
- Cut: Removes the selected text from the script and places it on the Clipboard.
- Copy: Copies the selected text, without removing it from the script, and places it on the Clipboard.

- Paste: Inserts the contents of the Clipboard at the current position of the insertion point.
- Undo: Reverses the effect of the proceeding editing change(s).
- Start : Begins execution of a script.
- Break: Suspends execution of an executing script and places the instruction pointer on the next line to be executed.
- End: Stops execution of a script.
- Toggle: Adds or removes a breakpoint on a line of BasicScript
- Breakpoint: code.
- Add Watch: Displays the Add Watch dialog box, in which you can specify the name of a BasicScript variable. That variable, together with its value (if any), is then displayed in the watch pane of Script Designer's application window.
- Calls: Displays the list of procedures called by the currently executing BasicScript script. Available only during break mode.
- Single Step: Executes the next line of a BasicScript script and then suspends execution of the script. If the script calls another BasicScript procedure, execution will continue into each line of the called procedure.
- Procedure Step: Executes the next line of a BasicScript script and then suspends execution of the script. If the script calls another BasicScript procedure, BasicScript will run the called procedure in its entirety.

Note: *If you forget the name of a toolbar tool, pass the pointer over the tool to display its name.*

Editing Your Script

This section explains how to use Script Designer to edit BasicScript code. Although, in some respects, editing code with Script Designer is like editing regular text with a word-processing program, Script Designer also has certain capabilities specifically designed to help you edit BasicScript code.

You'll learn how to move around within your script, select and edit text, add comments to your script, break long BasicScript statements across multiple lines, search for and replace selected text, and perform a syntax check of your script.

This subsection provides an overview of the editing operations you can perform with Script Designer—including inserting, selecting, deleting, cutting, copying, and pasting material—and explains how to undo, or reverse, the most recent editing operations. You may wish to refer to the lists of keyboard shortcuts in the preceding section, which contain a group of editing shortcuts that can be used to perform many of the operations discussed here.

Navigating Within a Script

The lists of keyboard shortcuts in the preceding section contain a group of navigating shortcuts, which you can use to move the insertion point around within your script. When you move the insertion point with a keyboard shortcut, Script Designer scrolls the new location of the insertion point into view if it is not already displayed. You can also reposition the insertion point with the mouse and the Goto Line command, as explained below.

Script Designer differs from most word-processing programs in that it allows you to place the insertion point anywhere within your script, including in “empty spaces.” (Empty spaces are areas within the script that do not contain text, such as a tab’s expanded space or the area beyond the last character on a line.)

Here’s how to use the mouse to reposition the insertion point. This approach is especially fast if the area of the screen to which you want to move the insertion point is currently visible.

To move the insertion point with the mouse:

1. Use the scroll bars at the right and bottom of the display to scroll the target area of the script into view if it is not already visible.
2. Place the mouse pointer where you want to position the insertion point.
3. Click the left mouse button.

The insertion point is repositioned.

Note: *When you scroll the display with the mouse, the insertion point remains in its original position until you reposition it with a mouse click. If you attempt to perform an editing operation when the insertion point is not in view, Script Designer automatically scrolls the insertion point into view before performing the operation.*

Here’s how to jump directly to a specified line in your script. This approach is especially fast if the area of the screen to which you want to move the insertion point is not currently visible but you know the number of the target line.

To move the insertion point to a specified line in your script:

1. Press F4. Script Designer displays the Goto Line dialog box.
2. Enter the number of the line in your script to which you want to move the insertion point.
3. Click the **OK** button or press Enter.

The insertion point is positioned at the start of the line you specified. If that line was not already displayed, Script Designer scrolls it into view.

Note: *The insertion point cannot be moved so far below the end of a script as to scroll the script entirely off the display. When the last line of your script becomes the first line on your screen, the script will stop scrolling, and you will be unable to move the insertion point below the bottom of that screen.*

Inserting Text

In Script Designer, inserting text and other characters such as tabs and line breaks works much the same as it does in a word-processing program: you position the insertion point at the desired location in the script and start typing. However, as noted in the preceding subsection, Script Designer lets you position the insertion point in “empty spaces”. This means that you can also insert text into empty spaces—a feature that comes in handy when you want to insert a comment in the space beyond the end of a line in your script. Adding comments to your script is discussed later in this section. When you insert characters beyond the end of a line, the space between the insertion point and the last character on the line is backfilled with tab characters.

Another way in which Script Designer differs from word-processing programs is that in Script Designer, text does not wrap. If you keep entering text on a given line, eventually you will reach a point at which you can enter no more text on that line. Therefore, you control the line breaks by pressing Enter when you want to insert a new line in your script. The effect of pressing Enter depends on where the insertion point is located at the time:

- If you press Enter with the insertion point at or beyond the end of a line, a new line is inserted after the current line.
- If you press Enter with the insertion point at the start of a line, a new line is inserted before the current line.
- If you press Enter with the insertion point within a line, the current line is broken into two lines at that location.

If you press Tab, a tab character is inserted at the location of the insertion point, which causes text after the tab to be moved to the next tab position. If you insert new text within a tab's expanded space, the text that originally appeared on that line is moved to the next tab position each time the new text that you are entering reaches the start of another tab position.

When you enter certain types of text in Script Designer, the text automatically appears in a distinctive color. The default colors, which you can change, are as follows:

- When you type keywords, they appear in blue.
- When you type identifier text, it appears in black.
- When you type comments (beginning with either an apostrophe or "REM"), they appear in green.

Selecting Text

You can use either the mouse or the keyboard to select text and other characters in your script. Regardless of which method you use, you should be aware that in Script Designer, you can select either a portion of one line or a series of whole lines. You cannot select a portion of one line plus one or more whole lines. When you are selecting multiple lines and start or end your selection partway through a line, Script Designer automatically extends the selection to include the entire starting and ending lines.

To select text with the mouse:

1. Place the mouse pointer where you want your selection to begin.
2. While pressing the left mouse button, drag the mouse until you reach the end of your selection, and release the mouse button.

-Or-

While pressing Shift, place the mouse pointer where you want your selection to end and click the left mouse button. The selected text is highlighted on your display.

Another way to select one or more whole lines with the mouse is to start by placing the mouse pointer in the left margin beside the first line you want to select. The pointer becomes a reverse arrow, which points toward the line of text. Click the left mouse button to select a single line; press the left mouse button and drag up or down to select multiple lines.

Here's how to use keyboard shortcuts to select text in your script.

To select text with the keyboard:

1. Place the insertion point where you want your selection to begin.
2. While pressing Shift, use one of the navigating keyboard shortcuts to extend the selection to the desired ending point.

The selected text is highlighted on your display.

Note: *When you intend to select an entire single line of text in your script, it is important to remember to extend your selection far enough to include the hidden end-of-line character. This character inserts a new line in your script.*

Here's how to use the keyboard to select one or more whole lines in your script.

To select an entire line of text with the keyboard:

1. Place the insertion point at the beginning of the line you want to select.
2. Press Shift + Down arrow. The entire line, including the end-of-line character, is selected.
3. To extend your selection to include additional whole lines of text, repeat step 2.

Once you have selected text within your script, you can perform a variety of other editing operations on it, including deleting the text, placing it on the Clipboard by either cutting the text or copying it), and pasting it.

Deleting Text

When you delete material, it is removed from your script without being placed on the Clipboard. This section explains how to remove one or more characters, selected text or entire lines from your script.

To delete text:

To remove a single character to the left of the insertion point, press BkSp once; to remove a single character to the right of the insertion point, press Del once. To remove multiple characters, hold down BkSp or Del.

-Or-

To remove text that you have selected, press BkSp or Del.

-Or-

To remove an entire line, place the insertion point in that line and press Ctrl+Y.

Here's how to remove an unwanted line break from your script.

To combine the current line with the following line:

1. Place the insertion point after the last character on the current line.
2. Press Del once to delete the hidden end-of-line character.

The current line and the following line are combined.

Note: *If any spaces were entered at the end of the current line, you may have to press Del one or more additional times to remove these hidden characters first before you can delete the end-of-line character. Pressing BkSp with the insertion point at the start of a line has no effect—that is, it will not combine the current line with the preceding line.*

Cutting and Copying Text

You can place material from your script on the Clipboard by either cutting it or copying it.

To cut a selection:

- Press Ctrl+X.

The selection is removed from your script and placed on the Clipboard.

To copy a selection:

- Press Ctrl+C.

The selection remains in your script, and a copy of it is placed on the Clipboard.

Pasting Text

Once you have cut or copied material to the Clipboard, here's how to paste it into your script at another location.

To paste the contents of the Clipboard into your script:

1. Position the insertion point where you want to place the contents of the Clipboard.
2. Press Ctrl+V.

The contents of the Clipboard appear at the location of the insertion point. If you wish to delete a block of text and insert the contents of the Clipboard in its place, you can combine the two operations by first selecting the text you want to remove and then pressing Ctrl+V to replace it with the contents of the Clipboard.

Undoing Editing Operations

You can undo editing operations that produce a change in your script, including:

- The insertion of a series of characters
- The insertion of a block of text from the Clipboard
- The deletion of a series of characters
- The deletion or cutting of a block of text

You can't undo operations that don't produce any change in your script, such as moving the insertion point, selecting text, and copying material to the Clipboard.

To undo an editing operation:

- Press Ctrl+Z.

Your script is restored to the way it looked before you performed the editing operation.

Adding Comments to Your Script

You can add comments to your script to remind yourself or others of how your code works. Comments are ignored when your script is executed. In BasicScript, the apostrophe symbol (‘) is used to indicate that the text from the apostrophe to the end of the line is a comment.

Here's how to designate an entire line as a comment.

To add a full-line comment:

1. Type an apostrophe (‘) at the start of the line.
2. Type your comment following the apostrophe.

When your script is run, the presence of the apostrophe at the start of the line will cause the entire line to be ignored.

Here's how to designate the last part of a line as a comment.

To add a comment at the end of a line of code:

1. Position the insertion point in the empty space beyond the end of the code line.
2. Type an apostrophe (‘).
3. Type your comment following the apostrophe.

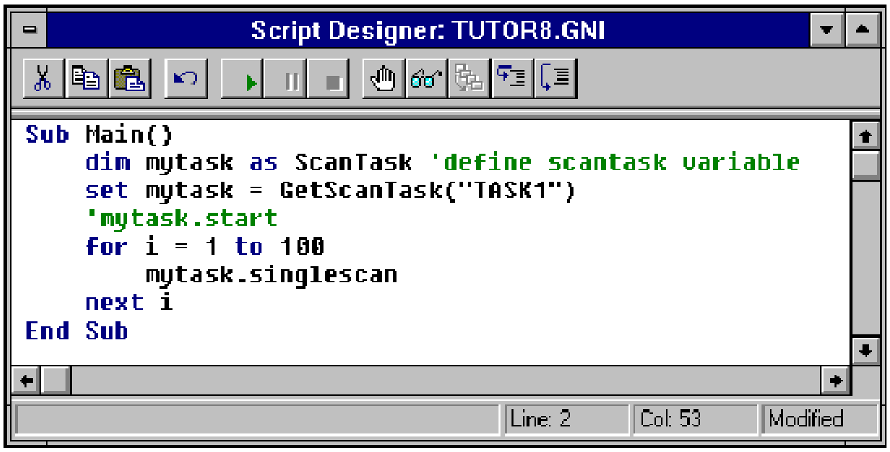


Figure 10-1: Adding Comments to Script

When your script is run, the code on the first portion of the line will be executed, but the presence of the apostrophe at the start of the comment will cause the remainder of the line to be ignored.

Although you can place a comment at the end of a line containing executable code, you cannot place executable code at the end of a line containing a comment. The presence of the apostrophe at the start of the comment would cause the balance of the line (including the code) to be ignored.

Breaking a BasicScript Statement across Multiple Lines

By default, in Script Designer, a single BasicScript statement can extend only as far as the right margin, and each line break represents a new statement. However, you can override this default if you want to break a long statement across two or more lines.

Here’s how to indicate that two or more lines of BasicScript code should be treated as a single statement when your script is run.

To break a BasicScript statement across multiple lines:

1. Type the BasicScript statement on multiple lines, exactly the way you want it to appear.
2. Place the insertion point at the end of the first line in the series.
3. Press the spacebar once to insert a single space.
4. Type an underscore (_).

Note: *The underscore is the line-continuation character, which indicates that the Basic-Script statement continues on the following line.*

5. Repeat steps 2–4 to place a line-continuation character at the end of each line (except the last) in the series.

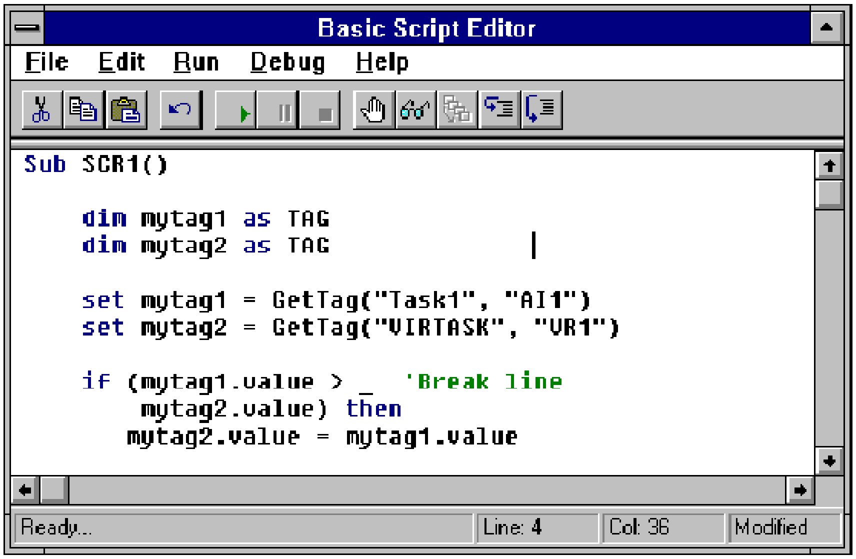


Figure 10-2: Breaking a Statement Across Multiple Lines

When you run your script, the code on this series of lines will be executed as a single BasicScript statement, just as if you had typed the entire statement on the same line.

Checking the Syntax of a Script

When you try to run or debug a script whose syntax hasn't been checked, Script Designer first performs a syntax check automatically.

Here's how to perform a syntax check manually when you are editing your script, without having to run it.

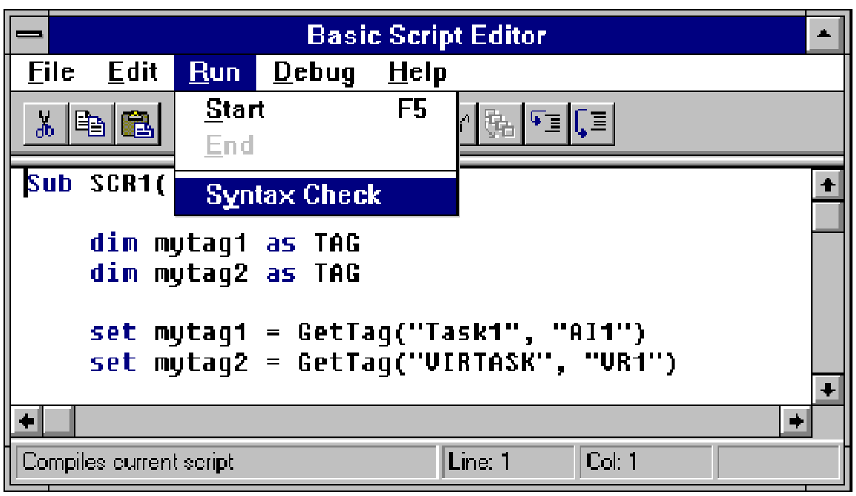


Figure 10-3: Checking a Script's Syntax

To perform a syntax check:

1. From the Run menu, choose the Syntax Check command. Script Designer either indicates that no errors have been found or displays an error message. This message specifies the first line in your script where an error has been found, and briefly describes the nature of the error.
2. Click the OK button or press Enter. If Script Designer has found a syntax error, the line containing the error is highlighted on your display.
3. Correct the syntax error.
4. Repeat steps 1–3 until you have found and corrected all syntax errors.

Running Your Scripts

Once you have finished editing your script, you will want to run it to make sure it performs the way you intended. You can also pause or stop an executing script.

Here's how to compile your script, if necessary, and then execute it.

To run your script:

- Click the Start tool on the toolbar.

-Or-

Press F5.

The script is compiled (if it has not already been compiled), the focus is switched to the parent window, and the script is executed.

Note: *During script execution, Script Designer's application window is available only in a limited manner. Some of the menu commands may be disabled, and the toolbar tools may be inoperative.*

To pause an executing script:

- Press Ctrl+Break.

Execution of the script is suspended, and the instruction pointer (a gray highlight) appears on the line of code where the script stopped executing.

Note: *The instruction pointer designates the line of code that will be executed next if you resume running your script.*

To stop an executing script:

- Click the End tool on the toolbar.

Note: *Many of the functions of Script Designer's application window may be unavailable while you are running a script. If you want to stop your script but find that the toolbar is currently inoperative, press Ctrl+Break to pause your script, then click the End tool.*

Debugging Your Scripts

This section presents some general information that will help you more effectively use Script Designer's debugging capabilities. The section also explains how to trace the execution of your script, how to set and remove breakpoints, and how to add watch variables and modify their value.

Using the BasicScript Debugger

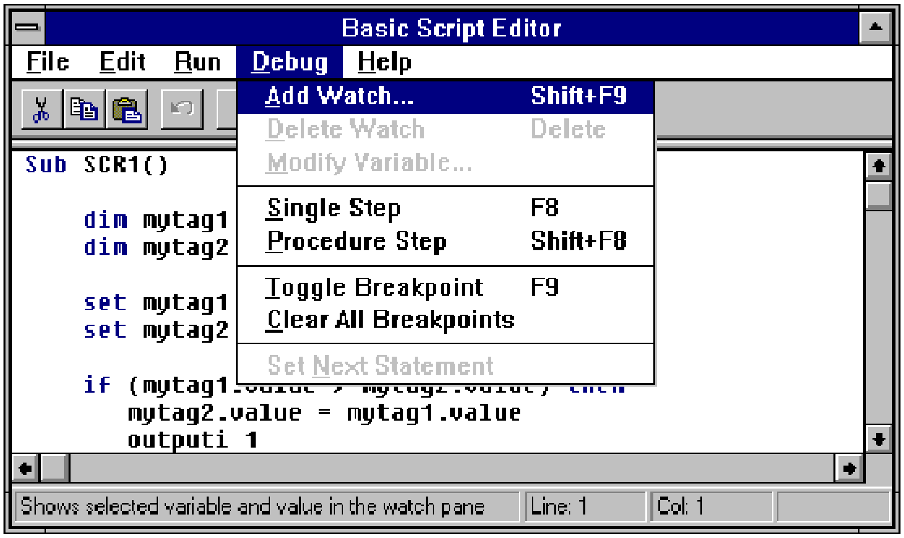


Figure 10-4: Using the BasicScript Debugger

While debugging, you are actually executing the code in your script line by line. Therefore, to prevent any modifications to your script while it is being run, the edit pane is read-only during the debugging process. You are free to move the insertion point throughout the script, select text and copy it to the Clipboard as necessary. You can also set breakpoints, and add and remove watch variables, but you cannot make any changes to the script until you stop running it.

To let you follow and control the debugging process, Script Designer displays an instruction pointer on the line of code that is about to be executed. This line will be executed next if you either proceed with the debugging process or run your script at full speed. When the instruction pointer is on a line of code, the text on that line appears in black on a gray background that spans the width of the entire line.

Tracing Script Execution

Script Designer gives you two ways to trace script execution—single step and procedure step—, both of which involve stepping through your script code line by line. The distinction between the two is that the single step process traces into calls to user-defined functions and subroutines, whereas the procedure step process does not trace into these calls (although it does execute them).

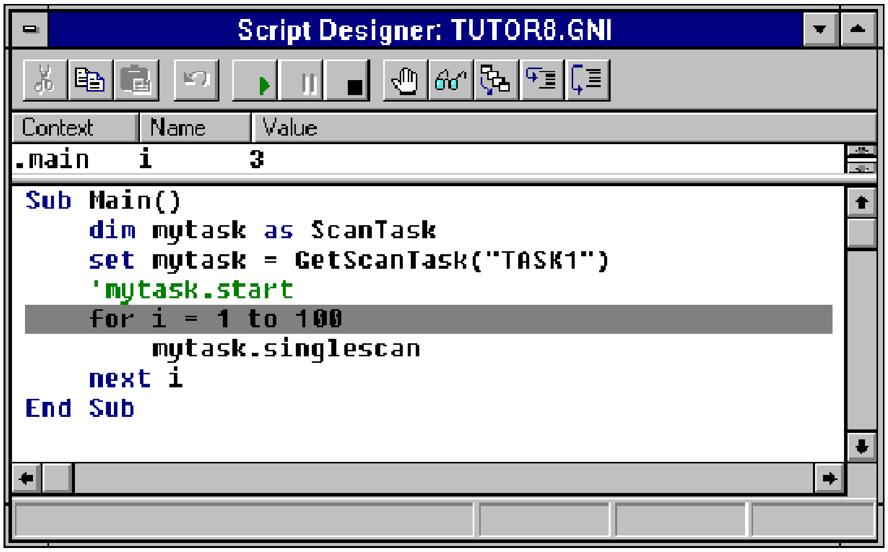


Figure 10-5: Tracing a Script Statement

Here's how to trace the execution of your script using the single step or procedure step method.

To step through your script:

1. Click the Single Step or Procedure Step tool on the toolbar.

-Or-

Press F8 (Single Step) or Shift+F8 (Procedure Step).

Script Designer places the instruction pointer on the Sub Main line of your script.

Note: *When you initiate execution of your script with any of these methods, the script will first be compiled, if necessary. Therefore, there may be a slight pause before execution actually begins. If your script contains any compile errors, it will not be executed. To debug your script, first correct any compile errors, then initiate execution again.*

2. To continue tracing the execution of your script line by line, repeat step 1. Each time you repeat step 1, Script Designer executes the line containing the instruction pointer and moves the instruction pointer to the next line to be executed.
3. When you finish tracing the execution of your script, click the Start tool on the toolbar (or press F5) to run the balance of the script. Click the End tool to halt execution of the script.

When you are stepping through a subroutine, you may need to determine the procedure calls by which you arrived at that point in your script.

Here's how to use the Calls dialog box to obtain this information.

To display the Calls dialog box:

1. Click the Calls tool on the toolbar. Script Designer displays the Calls dialog box, which lists the procedure calls made by your script in the course of arriving at the present subroutine.
2. From the Calls dialog box, select the name of the procedure you wish to view.
3. Click the Show button.

Script Designer highlights the currently executing line in the procedure you selected, scrolling that line into view if necessary (During this process, the instruction pointer remains in its original location in the subroutine.). When you are stepping through a subroutine, you may want to repeat or skip execution of a section of code.

Here’s how to use the Set Next Statement command to move the instruction pointer to another line within that subroutine.

To move the instruction pointer to another line within a subroutine:

1. Place the insertion point in the line where you want to resume stepping through the script.
2. From the Debug menu, choose the Set Next Statement command.

The instruction pointer moves to the line you selected, and you can resume stepping through your script from there.

Note: *You can only use the Set Next Statement command to move the instruction pointer within the same subroutine. If you place the insertion point on a line that is not in the same subroutine, the Set Next Statement command will be disabled in the Debug menu.*

Setting and Removing Breakpoints

If you want to start the debugging process at the first line of your script and then step through your code line by line, the method described in the preceding subsection works fine. If you only need to debug one or more portions of a long script, that method can be cumbersome.

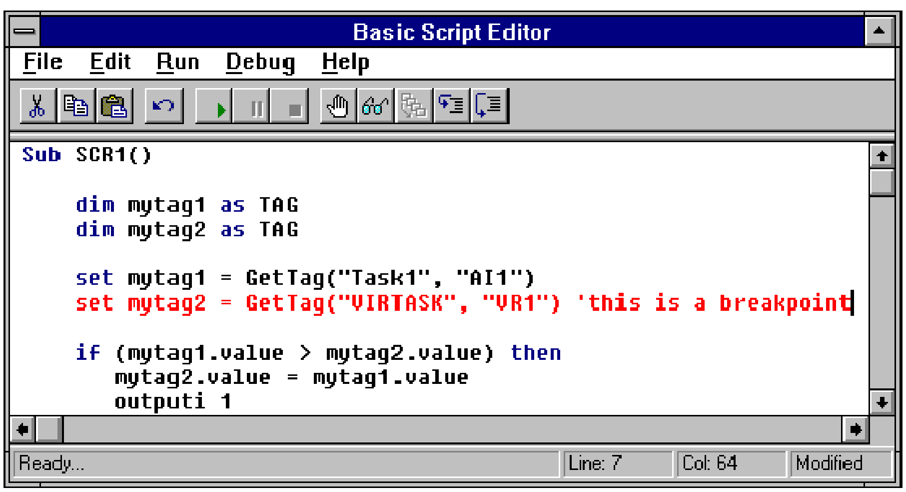


Figure 10-6: Setting and Removing Breakpoints

An alternate strategy is to set one or more breakpoints at selected lines in your script. Script Designer suspends execution of your script just before it reaches a line containing a breakpoint, thereby allowing you to begin or resume stepping through the script from that point.

Setting Breakpoints

You can set breakpoints to begin the debugging process partway through your script, to continue debugging at a line outside the current subroutine, and to debug only selected portions of your script.

Valid breakpoints can only be set on lines in your script that contain code, including lines in functions and subroutines. Although you can set a breakpoint anywhere within a script prior to execution, when you compile and run the script, invalid breakpoints (that is, breakpoints on lines that don't contain code) are automatically removed. While you are debugging your script, Script Designer will beep if you try to set a breakpoint on a line that does not contain code.

Here's how to begin the debugging process at a selected point in your script.

To start debugging partway through a script:

1. Place the insertion point in the line where you want to start debugging.
2. To set a breakpoint on that line, click the Toggle Breakpoint tool on the toolbar.

-Or-

Press F9.

The line on which you set the breakpoint now appears in contrasting type.

3. Click the Start tool on the toolbar.

-Or-

Press F5.

Script Designer runs your script at full speed from the beginning and then pauses prior to executing the line containing the breakpoint. It places the instruction pointer on that line to designate it as the line that will be executed next when you proceed with debugging or resume running the script.

If you want to continue debugging at another line in the same subroutine, you can use the Set Next Statement command in the Debug menu to move the instruction pointer to the desired line.

If you want to continue debugging at a line that isn't within the same subroutine, here's how to move the instruction pointer to that line.

To continue debugging at a line outside the current subroutine:

1. Place the insertion point in the line where you want to continue debugging.
2. To set a breakpoint on that line, press F9.
3. To run your script, click the Start tool on the toolbar or press F5.

The script executes at full speed until it reaches the line containing the breakpoint and then pauses with the instruction pointer on that line. You can now resume stepping through your script from that point.

If you only need to debug parts of your script, here's how to facilitate the task by using breakpoints.

To debug selected portions of your script:

1. Place a breakpoint at the start of each portion of your script that you want to debug.

Note: Up to 255 lines in your script can contain breakpoints.

2. To run the script, click the Start tool on the toolbar or press F5. The script executes at full speed until it reaches the line containing the first breakpoint and then pauses with the instruction pointer on that line.
3. Step through as much of the code as you need to.
4. To resume running your script, click the Start tool on the toolbar or press F5. The script executes at full speed until it reaches the line containing the second breakpoint and then pauses with the instruction pointer on that line.
5. Repeat steps 3 and 4 until you have finished debugging the selected portions of your script.

Removing Breakpoints

Breakpoints can be removed either manually or automatically. Here's how to delete breakpoints manually one at a time.

To remove a single breakpoint manually:

1. Place the insertion point on the line containing the breakpoint that you want to remove.
2. Click the Toggle Breakpoint tool on the toolbar.

-Or-

Press F9.

The breakpoint is removed, and the line no longer appears in contrasting type.

Here's how to delete all breakpoints manually in a single operation.

To remove all breakpoints manually:

- Select the Clear All Breakpoints command from the Debug menu.

Script Designer removes all breakpoints from your script.

Breakpoints are removed automatically under the following circumstances: (1) as mentioned earlier, when your script is compiled and executed, breakpoints are removed from lines that don't contain code. (2) When you exit from Script Designer, all breakpoints are cleared.

Adding a Watch Variable

As you debug your script, you can use Script Designer's watch pane to monitor selected variables. For each of the variables on this watch variable list, Script Designer displays its context, name, and value. The values of the variables on the watch list are updated each time you enter break mode.

Here's how to add a variable to Script Designer's watch variable list.

To add a watch variable:

1. Click the Add Watch tool on the toolbar.

-Or-

Press Shift+F9.

Script Designer displays the Add Watch dialog box.

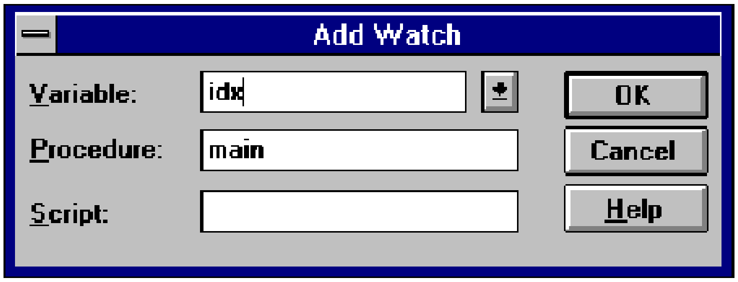


Figure 10-7: Add a watch variable

2. In the Variable box, type or select the name of the variable you want to add to the watch variable list.

If you are executing the script, you can click the arrow in the Variable box to display the names of all variables that are “in scope,” or defined within the current function or subroutine. You can then select the variable you want from the open list.

3. In the Procedure box, type or select the name of the procedure containing the variable you want to watch. If the variable you want to watch is a private or public variable, then type or select “(All Procedures)”.
4. In the Script box, type or select the name of the script containing the variable you want to watch. If the variable you want to watch is a public variable, then type or select “(All Scripts)”.
5. Click OK to add the variable to the watch variable list.

Script Designer displays the context, name, and value of the variable in a three-column list in the watch pane. If you have previously added other watch variables, Script Designer will display these as well.

Types of Variables You Can Watch

Script Designer permits you to monitor only variables of fundamental data types, such as Integer, Long, Variant, and so on; you cannot watch complex variables, such as structures or arrays, or expressions using arithmetic operators. You can, however, watch individual elements of arrays or structure members using the following syntax:

```
[variable [(index,...)] [.member [(index,...)]]...]
```

where variable is the name of the structure or array variable, index is a literal number, and member is the name of a structure member.

For example, the following are valid watch expressions:

- a(1): Element 1 of array a
- person.age: Member age of structure person
- company(10,23).person.age: Member age of structure person that is at element 10,23 within the array of structures called company

Modifying or Deleting a Watch Variable

In order to modify the value of a variable or remove the variable from the watch pane, you must first select the desired variable. Here's how to select a variable on the list.

To select a watch variable:

- Place the mouse pointer on the variable you want to select and click the left mouse button.

-Or-

If one of the variables on the watch list is already selected, use the arrow keys to move the selection highlight to the desired variable.

-Or-

If the insertion point is in the edit pane, press F6 to highlight the most recently selected variable on the watch list and then use the arrow keys to move the selection highlight to the desired variable.

Note: *Pressing F6 again returns the insertion point to its previous position in the edit pane.*

When the debugger has control, you can modify the value of any of the variables on Script Designer's watch variable list. Here's how to change the value of a selected watch variable.

To modify the value of a variable on the watch variable list:

1. Place the mouse pointer on the name of the variable whose value you want to modify and double-click the left mouse button.

-Or-

Select the name of the variable whose value you want to modify and press Enter or F2.

Script Designer displays the Modify Variable dialog box.

Note: *The name of the variable you selected on the watch variable list appears in the Name field. If you want to change another variable, you can enter a different variable in the Name field. You can also select a different variable from the Variables list box, which shows variables defined within the current function or subroutine. When you use the Modify Variable dialog box to change the value of a variable, you don't have to specify the context. Script Designer first searches locally for the definition of that variable, then privately, then publicly.*

2. Enter the new value for your variable in the Value field.
3. Click the **OK** button.

The new value of your variable appears on the watch variable list.

When changing the value of a variable, Script Designer may convert the value you entered to match the type of the variable. For example, if you change the value of an Integer variable to 1.7, Script Designer converts this value from a floating-point number to an Integer, assigning the value 2 to the variable.

When modifying a Variant variable, Script Designer needs to determine both the type and value of the data. Script Designer uses the following logic in performing this assignment (in this order):

The following applies to the following values:

- Null: The Variant variable is assigned Null (VarType 1).
- Empty: The Variant variable is assigned Empty (VarType 0).

- True: The Variant variable is assigned True (VarType 11).
- False: The Variant variable is assigned False (VarType 11).
- number: The Variant variable is assigned the value of number. The type of the variant is the smallest data type that fully represents that number. You can force the data type of the variable by using a type-declaration letter following number, such as %, #, &, !, or @.
- date: The Variant variable is assigned the value of the new date (VarType 7).
- Anything else: The Variant variable is assigned a String (VarType 8).

Script Designer will not assign a new value if it cannot be converted to the same type as the specified variable.

Here's how to delete a selected variable from Script Designer's watch variable list.

To delete a watch variable:

1. Select the variable on the watch list.
2. Press Del.

The selected variable is removed from the watch list.

Exiting from Script Designer

Here's how to get out of Script Designer. What happens when you exit depends on (1) whether you have made changes to your script and (2) whether your script contains errors.

To exit from Script Designer:

- Choose the Exit and Return command from the File menu.

If you have made changes to your script, Script Designer displays a dialog box asking whether you want to save the script. If you either click the No button or click the Yes button and your script contains no errors, you exit from Script Designer immediately. If you click the Yes button and your script contains errors, Script Designer highlights the line containing the first error and displays a dialog box asking whether you want to exit anyway. If you click the Yes button, Script Designer saves your script, errors and all, and then you exit from Script Designer.

If you haven't made any changes to your script, you exit from Script Designer immediately, regardless of whether the script contains errors from a previous editing session.

Programming with GeniDAQ

This powerful Visual Basic for Application (VBA) as a scripting engine is licensed from Summit Software Inc. BasicScript is the most important component providing programmability in GeniDAQ.

The script engine is a set of DLLs that facilitate the compilation of script programs at build-time and execution of scripts at runtime. It not only provides the capability to manipulate tasks, but also provides the interface to interact with DOS, Windows, and other applications through DDE, OLE, ODBC (SQL). The syntax of BasicScript is very similar to Microsoft VBA (visual basic for application in Excel, Word, Access, etc.) and MS Visual Basic. Both BasicScript and VBA have functions that are not included in the other, but over 95% of the functions and procedures are identical. It is possible to take a Visual Basic source code, then compile and execute it under BasicScript. This can be done without changing a word if only common functions are used. A dialog box editor is included so that program designers can create their own dialog box to interact with the operators. The scripting feature is what makes GeniDAQ suitable for real-life situations where customization is necessary to make the program work smoothly with the existing operating procedures in the factory and assembly line.

The script designer is basically a text editor with some convenient features for editing script code. The same editor is used for editing the main script and scripts inside a task. The main script, if present, takes control during the entire runtime once it is started. The main script can be used to do things such as starting a task, stopping a task, etc. Each scan task has a pre-task script and a post-task script. These two scripts are used to initialize or reset tag values on some conditions. The main script is executed only once for the entire strategy while the pre-task and post-task scripts are executed once every scan. The script will be compiled into p-code after editing so it won't need to be compiled again.

Main Script

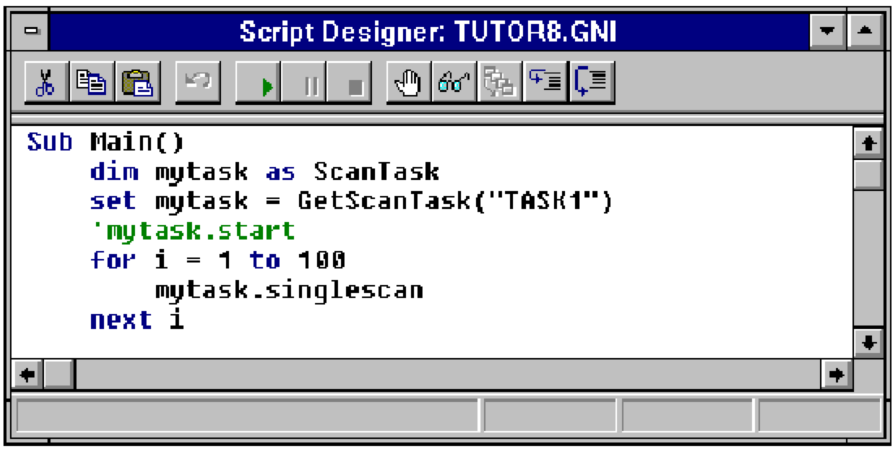


Figure 10-8: Main Script Program

The main script, if present, takes control of the entire runtime once it is started. The main script can be used to do things such as starting a task, stopping a task, etc.

Pre-Task and Post-Task script

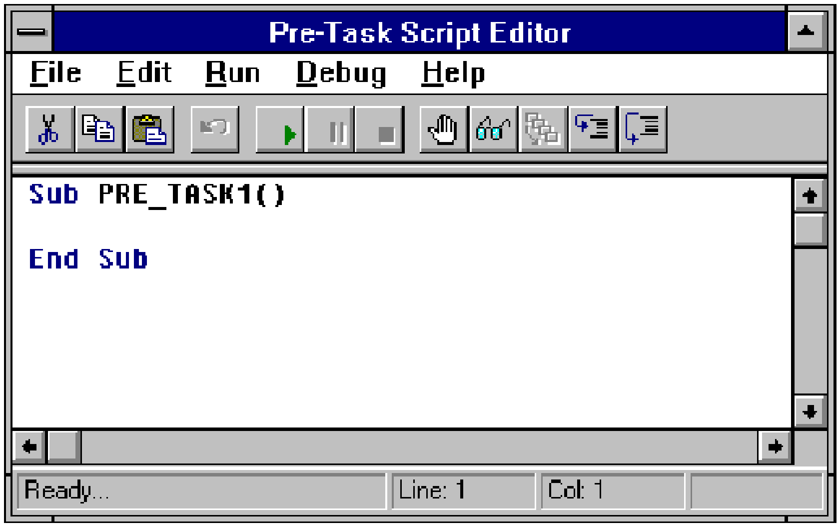


Figure 10-9: Pre-task Script Editor

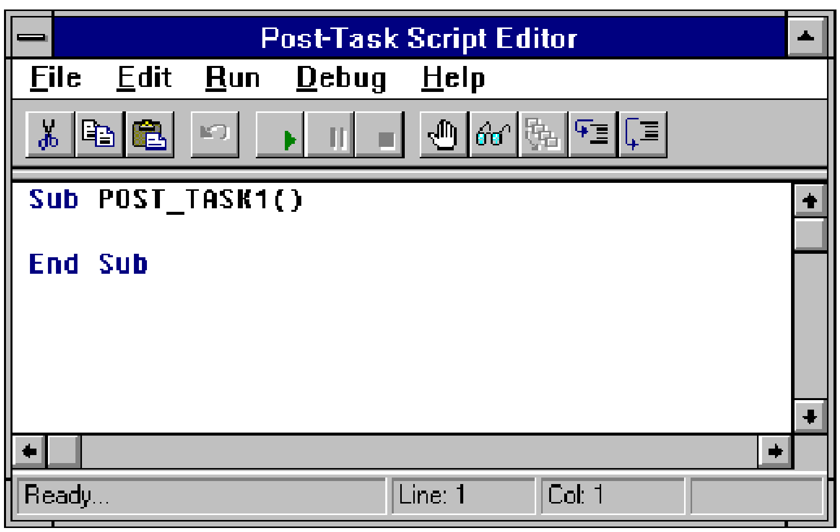


Figure 10-10: Post-task Script Editor

Each scan task has a pre-task script and a post-task script. User can use these two scripts to initialize or reset tag value on some conditions.

BasicScript

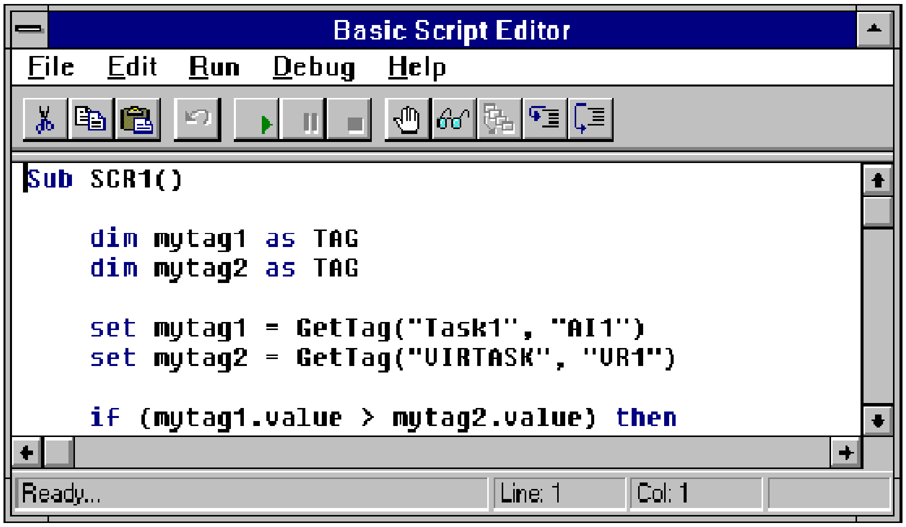


Figure 10-11: BasicScript Block Editor

BasicScript is a task block in Task Designer Toolbox. It is designed to provide total flexibility so you can employ Visual Basic functions to do comparisons, calculations, etc. BasicScript supports multiple inputs from all types of blocks. Its output can be routed to any number of blocks. For detailed information, please refer to chapter 5.3.27 BasicScript block.

Note: *"DIM" may be used to declare one variable per line. If you declare two or more variables in one line, the execution result will be unpredictable.*

BasicScript GeniDAQ Commands

Overview

In order to manipulate tasks and runtime I/O data in the BasicScript engine, GeniDAQ adds many functions into BasicScript and can be programmed using standard Visual Basic functions. The Added GeniDAQ functions are categorized in the following sets:

System

This set of function calls is used to control system operations. You can use these function calls in the Pre-Task, Post-Task script and BasicScript block.

- SystemStop: Stops the execution of GeniDAQ
- SystemExit: Stops the execution of GeniDAQ and exits the GeniDAQ program
- GetNodeState: Retrieves the communication status with a remote node
- OverRunTimerSwh: Enables or disables the timer overrun message for a task that issues the command.
- UpdateHoldFile: Records current values and restore them at next system start.

Scan Task

This set of function calls is used to manipulate scan tasks in GeniDAQ. You can use these function calls in the Main Script program or in the Pre-Task and Post-Task script programs.

- ScanTask: Define a ScanTask object
- GetScanTask: Return the ScanTask object specified
- Start: Start to run the ScanTask
- Stop: Stop the ScanTask
- SingleScan: Do a one time scan of the ScanTask
- GetStatus: Return the status of specified ScanTask

Tag

This set of function calls is used to access task blocks in the GeniDAQ data center. You can use these function calls in the Main Script program, Pre-Task and Post-Task script programs and/or BasicScript blocks.

- Tag: Define a Tag Object
- GetTag: Return the Tag object specified
- Value: Property of the tag, return current value of tag
- Array: Property of the tag, return current value of tag's channel data.
- Lock: Locks the value of the tag to prevent the written by another code.
- SetLockedValue: Sets the value of the locked tag
- Unlock: Unlock a locked tag.

Display

This set of function calls is used to manipulate multiple displays in GeniDAQ. You can use these function calls in the Main Script program or in the Pre-Task and Post-Task script programs.

- Display: Switch to the display specified

BasicScript Block

This set of function calls is used to manipulate the output of BasicScript blocks in GeniDAQ. These function calls are used in BasicScript blocks only.

- Outputi: Output integer to another block
- Outputl: Output long integer to another block
- Outputf: Output single float to another block
- Outputs: Output string to another block

System

SystemStop (method)

Syntax

```
SystemStop
```

Description

Stops the execution of GeniDAQ

Example

```
Sub SCR1()
   dim MyTag as Tag
   set MyTag = GetTag(“DISP1”,”BBTN1")
      if MyTag.Value = 1 then
         SystemStop
   end if
End Sub
```

See Also

SystemExit

SystemExit (method)

Syntax

```
SystemExit
```

Description

Stops the execution of GeniDAQ and exits the GeniDAQ program

Example

```
   Sub SCR1()
      dim Mytag as Tag
   set Mytag = GetTag(“DISP1”,”BBTN1")
      if MyTag.Value = 1 then
         SystemExit
   end if
End Sub
```

See Also

SystemStop

GetNodeState (method)

Syntax

```
GetNodeState
```

Description

Retrieves the communication status with a remote node

Example

```
Sub SCR1()
Dim Conn as Integer
Conn = GetNodeState(“Node1”)
if Conn = 0 then
   Outputs “Disconnect with Node1”
else
   Outputs “Connect with Node1”
end if
End Sub
```

OverRunTimerSwh (method)

Syntax

```
OverRunTimerSwh
```

Description

Enables or disables the timer overrun message for a task that issues the command.

Comments

You can use the command at input values in a dialog box.

Example

```
Sub SCR1()
   dim MyTag as Tag
   set MyTag = GetTag(“DISP1”,”BBTN1")
      if MyTag.Value = 1 then
         OverRunTimerSwh 1 ‘ enable the timer overrun message
      else
         OverRunTimerSwh 0 ‘ disable the timer overrun message
```

```
   end if
End Sub
```

UpdateHoldFile (method)

Syntax

`UpdateHoldFile`

Description

Records current values and restore them at next system start.

Comments

This command is only effective for the blocks that enable the save and restore function, including knob, numeric control, slider, button, conditional button, digital output, analog output, and log file block.

Example

```
Sub SCR1()
   dim MyTag as Tag
   set MyTag = GetTag(“DISP1”,”BBTN1")
      if MyTag.Value = 1 then
         UpdateHoldFile
      end if
End Sub
```

ScanTask

ScanTask (object type)

Syntax

`ScanTask`

Description

An object type used to declare a variable which accepts object returned from GetScanTask() function.

Comments

When declaring more than one variable on the same line, the syntax is:

```
dim MyTask1 as ScanTask, MyTask2 as ScanTask.
```

Example

```
'This example start the task MyTask
Sub Main()
   dim MyTask as ScanTask
   set MyTask = GetScanTask("TASK1")
   MyTask.Start
End Sub
```

See Also

GetScanTask(Function), GetStatus(method), Start(method), Stop(method), SingleScan(method)

ScanTaskObject.GetStatus (method)

Syntax

```
MyTask.GetStatus
```

Description

A method of the ScanTask object used to get the status of specified task.

Return

An integer value will be returned to represent the current status of specified task.

- 0 means the specified task is idle, that is task is not started or is stopped.
- 2 means the specified task is waiting for delayed time or system time set in task properties.
- 3 means the specified task is running for GeniDAQ scan.

Comments

Applies to ScanTask object. It is suggested that this method be used before start or stop task.

Example

```
'This example scan the task MyTask for 100 times
Sub Main()
   dim i as integer
   dim Mystatus as integer
   dim MyTask as ScanTask
   set MyTask = GetScanTask("TASK1")
   MyStatus = MyTask.GetStatus
   if (MyStatus == 0)
   then
      MyTask.Start
      MyTask.Stop
   end if
End Sub
```

See Also

GetScanTask(Function), GetStatus(method), Initialize(method), Start(method), Stop(method)

ScanTaskObject.SingleScan (method)

Syntax

```
MyTask.SingleScan
```

Description

A method the ScanTask object uses to do a single scan of a task.

Comments

Applies to ScanTask object. The ScanTask is scanned immediately regardless of the scan period specified in the ScanTask Setup dialog box. This call does not return until the scan is completed.

Example

```
'This example scan the task MyTask for 100 times
Sub Main()
   dim i as integer
   dim MyTask as ScanTask
   set MyTask = GetScanTask("TASK1")
   for i = 1 to 100
      MyTask.SingleScan
   next i
End Sub
```

See Also

GetScanTask(Function), GetStatus(method), Start(method), Stop(method)

ScanTaskObject.Start (method)

Syntax

MyTask.Start

Description

A method of the ScanTask object used to start a task.

Comments

Applies to ScanTask object. The ScanTask is started regardless of the starting method specified in the ScanTask Setup dialog box. This call returns immediately without waiting for the task to complete.

Example

```
'This example start the task MyTask
Sub Main()
   dim MyTask as ScanTask
   set MyTask = GetScanTask("TASK1")
   MyTask.Start
End Sub
```

See Also

GetScanTask(Function), GetStatus(method), Stop(method), SingleScan(method)

ScanTaskObject.Stop (method)

Syntax

```
MyTask.Stop
```

Description

A method of the ScanTask object used to stop a task.

Comments

Applies to ScanTask object.

Example

```
'This example stop the task MyTask
'Assume MyTask is running already
Sub Main()
   dim MyTask as ScanTask
   dim FileLength as Integer
   set MyTask = GetScanTask("TASK1")
   Open "test.dat" For Input As #1
   FileLength = Lof(1)
   If (FileLength > 32000) Then
      MyTask.Stop
   End If
End Sub
```

See Also

GetScanTask(Function), GetStatus(method), Start(method), SingleScan(method)

GetScanTask (function)

Syntax

```
Set ScanTaskObj = GetScanTask(taskname)
```

Description

Returns an object of type ScanTask if successful. Returns Null if the taskname specified can not be found or not valid.

Comments

ScanTaskObj is a variable declared as type ScanTask. taskname is a string expression specifying the task. The taskname should be in capital letters, for example, "TASK1".

Example

```
'This example start the task MyTask
Sub Main()
   dim MyTask as ScanTask
   set MyTask = GetScanTask("TASK1")
   MyTask,Initialize
   MyTask.Start
End Sub
```

See Also

ScanTask(object type), Start(method), Stop(method), SingleScan(method),GetStatus(method),

Tag

Tag (object type)

Syntax

`Tag`

Description

An object type used to declare a variable which accepts objects returned from GetTag() function.

Comments

When declaring more than one variable on the same line, the syntax is:

`dim MyTag1 as Tag, MyTag2 as Tag.`

Example

```
'This example obtain a value from a block
Sub Main()
   dim MyTag as Tag
   dim voltage as single
   set MyTag = GetTag("TASK2", "AI1")
  voltage =MyTag.Value
End Sub
```

See Also

`GetTag (function); tagObj.Value (property).`

tagObj.Value (Property)

Syntax

```
tagObj.Value
```

Description

Value is a property of Tag object. It is used to reference the value of a input tag.

Example

```
‘This example obtain a value from a block
Sub Main()
   dim MyTag as Tag
   dim voltage as single
   set MyTag = GetTag(“TASK2”, “AI1”)
   voltage =MyTag.Value
End Sub
```

See Also

GetTag (function); Tag (object type); Array(channel number).

tagObj.Array (Channel number)

Syntax

```
tagObj.array(channel number)
```

where Channel number: integer, from 0 to 15

Description

Array is a property of Tag object. It is used to reference the values of tag’s multiple channels.

Example

```
‘This example obtain a value from the first channel of AI block
Sub Main()
   dim MyTag as Tag
   dim voltage as single
   set MyTag = GetTag(“TASK2”, “AI1”)
   voltage =MyTag.Array(0)
End Sub
```

See Also

GetTag (function); Tag (object type); Value(Property).

GetTag (function)

Syntax

```
Set tagObj = GetTag(tableName$, tagName$)
```

Description

Returns an object of type Tag.

Comments

The GetTag function takes the following parameters:

- tableName$: String expression containing the name of the task or display or virtual.
- tagName$: String expression containing the name of the tag (block). Should be capitals.

Example

```
Sub Main()
   dim MyTag as Tag
   dim voltage as single
   set MyTag = GetTag("TASK2", "AI1")
   voltage = MyTag.Value
End Sub
```

See Also

Tag (object type); tagObj.Value (property)

tagObj.Lock (method)

Syntax

```
tagObj.Lock
```

Description

Locks the value of the tag to prevent the written by another code.

Comments

If you write a tag value in multiple tasks, such as virtual tags, you must lock it before write the value. Then GeniDAQ will lock the value of the tag to prevent the written by another code in other tasks simultaneously. After you complete the change, you must unlock it. Note if you just read the value, you don’t have to lock it. Be careful to use the method.

Example

```
Public VR1Cnt As Long
Public key As Long
Sub SCR1()
      dim MyTag as Tag
      set MyTag = GetTag(“VIRTASK”,”VR1")
      key = MyTag.Lock
      if key <> 0 then
         VR1Cnt = MyTag.Value + 2
         MyTag.SetLockedValue key, VR1Cnt
         MyTag.Unlock key
         key = 0
   end if
End Sub
```

See Also

SetLockedValue, Unlock

tagObj.SetLockedValue (method)

Syntax

```
tagObj.SetLockedValue
```

Description

Sets the value of the locked tag.

Comments

If you write a tag value in multiple tasks, such as virtual tags, you must lock it before write the value. Then GeniDAQ will lock the value of the tag to prevent the written by another code in other tasks simultaneously. After you complete the change, you must unlock it. Note if you just read the value, you don’t have to lock it. Be careful to use the method.

Example

```
Public VR1Cnt As Long
Public key As Long
Sub SCR1()
   dim MyTag as Tag
   set MyTag = GetTag(“VIRTASK”,”VR1")
   key = MyTag.Lock
      if key <> 0 then
         VR1Cnt = MyTag.Value + 2
         MyTag.SetLockedValue key, VR1Cnt
         MyTag.Unlock key
         key = 0
      end if
End Sub
```

See Also

Lock, Unlock

tagObj.Unlock (method)

Syntax

tagObj.Unlock

Description

Unlock a locked tag.

Comments

Be sure to unlock the value that you don’t use.

Example

```
Public VR1Cnt As Long
Public key As Long
Sub SCR1()
   dim MyTag as Tag
   set MyTag = GetTag(“VIRTASK”,”VR1")
   key = MyTag.Lock
      if key <> 0 then
         VR1Cnt = MyTag.Value + 2
         MyTag.SetLockedValue key, VR1Cnt
         MyTag.Unlock key
         key = 0
   end if
End Sub
```

See Also

Lock, SetLockedValue

Display

Display (statement)

Syntax

Display dvalue

Description

Used in the Main Script program or Pre-Task and Post-Task script to control the display order of multiple displays in a system.

Comments

dvalue is the number of display windows. For example, use Display(1) to show display1 window on screen.

- Dvalue: An integer specifying the number of display windows to show on screen.

Example

```
Sub Main()
   dim i as integer
   dim Mystatus as integer
   dim MyTask as ScanTask
   set MyTask = GetScanTask(“TASK1”)
   MyStatus = MyTask.GetStatus
   if (MyStatus == 3)
   then Display(1) “ to show Display1
   end if
End Sub
```

BasicScript Block

Outputf (statement)

Syntax

```
Outputf fvalue
Outputf channel , fvalue
```

Description

Used in the Basic Script Block to output a single float value to another block.

Comments

If the channel argument is not given, channel 0 is assumed. The Outputf statement takes the following parameters:

- Channel: Integer containing the output channel. Valid channel numbers are from 0 to 7.
- Fvalue: A single float specifying the value to be output.

Example

```
‘This example outputs a number to channel 0
dim voltage as single
If Voltage > 0.0 Then
   Outputf  voltage
else
   Outputf  - Voltage
End If
```

See Also
Outputi (statement); Outputl (statement); Outputs (statement).

Outputi (statement)

Syntax
```
Outputi ivalue

Outputi channel , ivalue
```

Description
Used in the Basic Script Block to output an integer value to another block.

Comments
If the channel argument is not given, channel 0 is assumed. The Outputi statement takes the following parameters:

- Channel: Integer containing the output channel. Valid channel numbers are from 0 to 7.
- Ivalue: Integer specifying the value to be output.

Example
```
'This example output a number to channel 0

dim count as integer

If count > 0 Then

   Outputi count

Else

   Outputi  -1

End If
```

See Also
Outputl (statement); Outputf (statement); Outputs (statement).

Outputl (statement)

Syntax
```
Outputl longvalue

Outputl channel , longvalue
```

Description
Used in the Basic Script Block to output a long integer value to another block.

Comments

If the channel argument is not given, channel 0 is assumed. The Outputl statement takes the following parameters:

- Channel: Integer containing the output channel. Valid channel numbers are from 0 to 7.
- Longvalue: long Integer specifying the value to be output.

Example

```
'This example output a number to two channels
dim count as long
If count >= 0 Then
   Outputl 0, count
   Outputl 1, count
End If
```

See Also

Outputi (statement); Outputf (statement); Outputs (statement).

Outputs (statement)

Syntax

```
Outputs svalue$
```

Where Outputs channel , svalue$

Description

Used in the Basic Script Block to output a string to another block.

Comments

If the channel argument is not given, channel 0 is assumed. The Outputs statement takes the following parameters:

- Channel: Integer containing the output channel. Valid channel numbers are from 0 to 7.
- svalue$: string expression specifying the value to be output.

Example

```
'This example output a string
dim S1 as string
dim S2 as string
S1 = "Hello,"
S2 = "World!"
Outputs 3, S1 & S2
```

See Also

Outputi (statement); Outputl (statement); Outputf (statement).

Notice

1. In the debug environment for the Main Script, Pre/post-task Script or Basic Script block, the following commands are disabled:
    - ScanTask.start
    - ScanTask.stop
    - ScanTask.SingleScan
    - ScanTask.GetStatus
    - OutputI
    - OutputL
    - OutputF
    - OutputS
    - Display
    - SystemStop
    - SystemExit

However, all commands will function at runtime.

2. When using the Msg command to create modeless dialogs or the Sleep command for waiting, do not stop GeniDAQ when the modeless dialog is still active or the Sleep command is still working.
3. Be careful when programming the script to avoid an infinite loop.
4. For ScanTask command:
    - To start/stop a task by Script, the task's starting method must be Inactive in Task Property
    - In Basic Script block or Pre/Post-task Script, it cannot start or stop the task by itself.
    - The possible task names passed into GetScanTask ("task name") command refer to Chapter 11, Sharing Real Time Data with Data Center.
5. For Tag command,
    - To retrieve/set values of tags in the Data Center via Basic Script. Make sure that the data is correct Refer to the Data Center for data types of tags. The user can also use Variant type in the Script to retrieve or set values of tags.
    - If the channel count of the specified tag is greater than 1, the user needs to use the Tag.Array[n] command to retrieve/set a value for channel n. Make sure n does not exceed the maximum number of channels. If using the Tag.Value command to retrieve/set a value, it will be the channel 0.
6. For Output command
    - Don't use these commands in main script or pre/post-task script. It is only for a Basic Script block.
    - Select the correct command to output the value. For example, if you need to output a string, select OutputS command and pass a string type parameter.
7. We strongly recommend you to define an error trap routine (OnError) to handle runtime errors. Otherwise, it may damage BasicScript engine. Please refer to the on-line help for OnError Statement.

Limitations

1. Strings are limited in length to 32764 characters.
2. The data area that holds public variables is limited to 16 KB.
3. The size of source code script is limited to 65534 characters.
4. Arrays can have up to 60 dimensions.
5. Variable names are limited to 80 characters.
6. Labels are limited to 80 characters.
7. The number of open DDE channels is not fixed; rather, it is limited only by available memory and system resources.
8. The number of open files is limited to 512 or the operating system limit.
9. The size of an array cannot exceed 32 KB.

Summary

GeniDAQ's BasicScript provides a powerful programming tool. You can use it for calculation, linking other Windows applications, accessing Database, control task/display, performing logic operations, and processing real time values.

11

Sharing Real Time Data with Data Center

Overview

Data Center provides an open environment for user to access real-time data in GeniDAQ. It supports the following interfaces for customer application to exchange data with GeniDAQ.

- DDE interface
- OLE automation interface

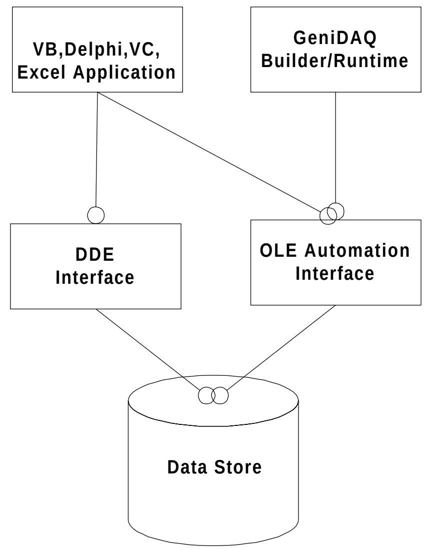


Figure 11-1: Data Center Programming Interface

Users can choose their favorite language under their demand.

This module is the central location for all the data in GeniDAQ. All the results of the blocks or the user data entered on the screen are passed to this centralized module. It is stored in memory for fast update and retrieval. The tag name is used as a key to find the data item in the data center. A hash table or B-tree structure can be used to speed up the update and retrieval. Each data item in the data application, like drivers and GeniDAQ, would use the tag name to get a block ID from the data center. The block ID is another key to find the data item in the data center.

Note: *GeniDAQ CE does not support the DDE and OLE Automation programming interface for Data Center.*

Contents

- Data Store
- DDE (Dynamic Data Exchange) Interface
- OLE (Object Linking and Embedded) Automation Interface
- Summary

Data Store

Data Store keeps the storage of Tag’s data. It supports three data types: LONG (32 bites), FLOAT (4 bytes) and STRING (128 bytes maximum).

Data Structure

The structure of data center is below:

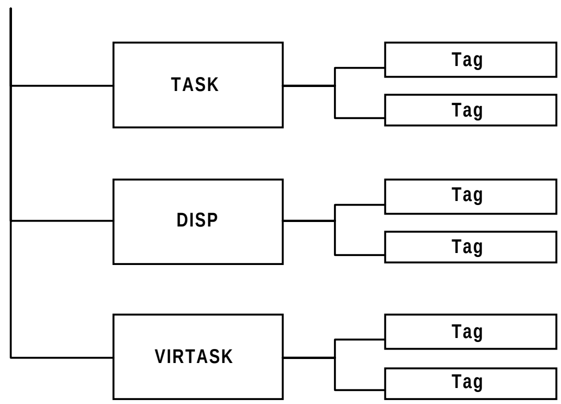


Figure 11-2: Data Center Data Structure

It consists of two levels. One is task level. There are three types in this level. TASK can be any task in Task Designer. DISP can be any display in Display Designer. VIRTASK contains all virtual tags. The other one is tag level. It contains all tags that belong to its parent task.

Available Tags

Not all GeniDAQ’s tags will be created in data center, for example Basic Script block. The following table lists all available tags created in data center.

The Tags Created By GeniDAQ

Block	Tag Name	Data Type	Channel Count
Analog Input	TASK1/AI1	Floating point	32
Analog Output	TASK1/AO1	Floating point	1
Digital Input	TASK1/DI1	Integer	1
Digital Output	TASK1/DO1	Long	1
Temperature	TASK1/TMP1	Floating point	1
Hardware Counter	TASK1/CTFQ1	Floating point	1
Hardware Alarm	TASK1/ALM1	Long	1
RS-232	TASK1/SER1	String	8
Input File	TASK1/INF1	Floating point	1
Alarm Log	TASK1/ALOG1	Long	1
Ramp	TASK1/RMP1	Floating point	1
Moving Average	TASK1/AVG1	Floating point	1
Single Calculation	TASK1/SOC1	Floating point	1
Timer	TASK1/ET1	Long	1
Time Stamp	TASK1/TS1	String	1
Counter	TASK1/CNT1	Long	1
On/Off Control	TASK1/ONF1	Integer	1
PID Control	TASK1/PID1	Floating point	1
DDE Client	TASK1/DDEC1	String	1
Conditional Sound	TASK1/SOUND1	Long	1
Beep	TASK1/SP1	Long	1
Button Control	DISP1/BBTN1	Long	1
Knob Control	DISP1/KNOB1	Floating point	1
Numeric Control	DISP1/NCTL1	Floating point	1
Slider Control	DISP1/SPIN1	Floating point	1
Ameter Display	DISP1/METER1	Floating point	1
Bar Display	DISP1/BAR1	Floating point	1
Indicator Display	DISP1/INDI1	Long	1
Drawing Display	DISP1/CELL1	Long	1
Conditional Button	DISP1/CBTN11	Long	1
Conditional Bitmap	DISP1/BMP1	Long	1
Conditional Text	DISP1/CTXT	String	1
Historical Trend	DISP1/HIST1	Floating point	8
Virtual Tags	VIRTASK/V1	Floating point	1

Figure 11-3: The Tags Created By GeniDAQ

Note: *(a) TASK1 can change to TASK2 to TASK8 that depends on the tag in which TASK. The tag name consists of the block type and ordinal number; for example, AI block with ordinal number 3, then the tag name is AI3.*

(b) DISP is the title of the display that is assigned in Display Property Menu.

(c) VIRTASK stores the VIRTAG tags that are added by the Add/Delete Virtual Tags menu.

(d) The maximum string length for string type tags is 128.

DDE Interface

Dynamic Data Exchange (DDE) is one of several mechanisms of interprocess communication (IPC) supported under Windows. Another one is OLE that will be discussed soon. DDE is the most popular and easiest interface for user. Just assign three character strings, application, topic, and item, then two applications can communicate with each other. Most applications support DDE interface, for examples, Microsoft Office, Microsoft Visual Basic, and Inprise Delphi. Besides, most hardware and software vendors of industrial automation also provide DDE drivers or support DDE interface.

GeniDAQ supports DDE with DDE Client Block and DDE Server Block. DDE Client Block requests data from another application. DDE Server Block sends data to another application. Please refer to *Chapter 3, Configuring Your System Function with Task Designer*.

OLE Automation

Three Objects for OLE Automation Interface

Compared to DDE, OLE is more powerful and flexible interprocess communication standard defined by Microsoft. OLE Automation (another term is ActiveX Automation) allows applications to expose objects to other applications. OLE Automation makes it possible for objects to not only exchange data with, and execute commands in other objects. These objects (automation object or automation server) consist of methods (another term for function calls) and properties (that is, data elements that can be read from or written to or that can be read-only or write-only). Through the OLE-defined standards for automation, users can call them from any OLE Automation client, such as a program written in Microsoft VC, Visual Basic, a Microsoft Excel macro, or Inprise Delphi.

GeniDAQ’s Data Center features an Automation Server that can be called from any OLE Automation client. It exposes three automation objects:

- GeniDAQ32.OleDB: It is the primary object for accessing the Tag’s data. You can use the following codes in Visual Basic to create the object.

```
Dim DBCenter as Object
Set DBCenter = CreateObject (“GeniDAQ32.OleDB)
```

- GeniDAQ32.TaskList: It is the object for browsing tasks.

```
Dim TaskList as Object
Set TaskList = CreateObject (“GeniDAQ32.TaskList”)
```

- GeniDAQ32.TagList: It is the object for browsing tags in the specified task.

```
Dim TagList as Object
Set TagList = CreateObject ("GeniDAQ32.TagList")
```

After these objects are created, then users can access their methods and properties.

Object Description

GeniDAQ32.OleDB Object

The supported methods of GeniDAQ32.OleDB object are listed below:

- GetTagDataLong: Return 32-bit integer value of specified tag

Syntax

```
long GetTagDataLong(BSTR szTaskName, BSTR szTagName, short Index);
```

Note: *Index represents the channel number for the tag that you wish.*

Note: *Make sure the data type of the tag that you access, then choose the corresponding method to access the tag.*

• GetTagDataFloat

Return 4-byte float value of specified tag.

Syntax

```
float GetTagDataFloat(BSTR szTaskName, BSTR szTagName, short Index);
```

• GetTagDataSTR

Return character string of specified tag.

Syntax

```
BSTR GetTagDataSTR(BSTR szTaskName, BSTR szTagName, short Index);
```

• SetTagDataLong

Set 32-bit integer value of specified tag in data center.

Syntax

```
boolean SetTagDataLong(BSTR szTaskName, BSTR szTagName, short Index,
long Data);
```

• SetTagDataFloat

Set 4-byte float value of specified tag in data center.

Syntax

```
boolean SetTagDataFloat(BSTR szTaskName, BSTR szTagName, short Index,
float Data);
```

• SetTagDataSTR

Set character string of specified tag in data center.

Syntax

```
boolean SetTagDataSTR(BSTR szTaskName, BSTR szTagName, short Index,
BSTR Data);
```

GeniDAQ32.TaskList and GeniDAQ32.TagList Object

The supported methods of GeniDAQ32.TaskList object and GeniDAQ32.TagList object are listed below:

- void GoTop(): Go to the top of task list.
- void GoBottom(): Check whether it is at the end of task list.
- BSTR Get(): Go to the bottom of task list.
- void GoNext(): Go to next tag in task list.
- boolean EndofList(): Return current task in task list.

OLE Automation Interface Example

The following example demonstrates how to browse the available tasks and tags created in a GeniDAQ project through OLE Automation interface. This example is created in Microsoft Visual Basic 5.0. You can also use Inprise Delphi to create a similar application. Please refer to the related documentation for your programming language.

1. Launch Microsoft Visual Basic 5.0 and new a Standard EXE type project.

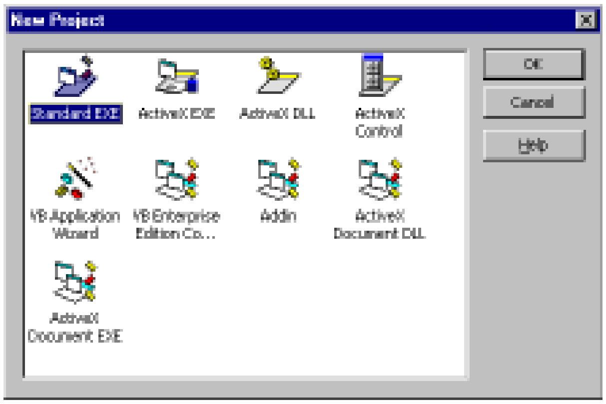


Figure 11-4: Create a New VB Project

2. Name your project as GoleDB.

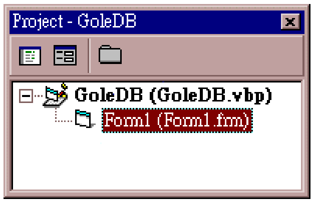


Figure 11-5: Name Your Project GoleDB

3. Design your form as follows:

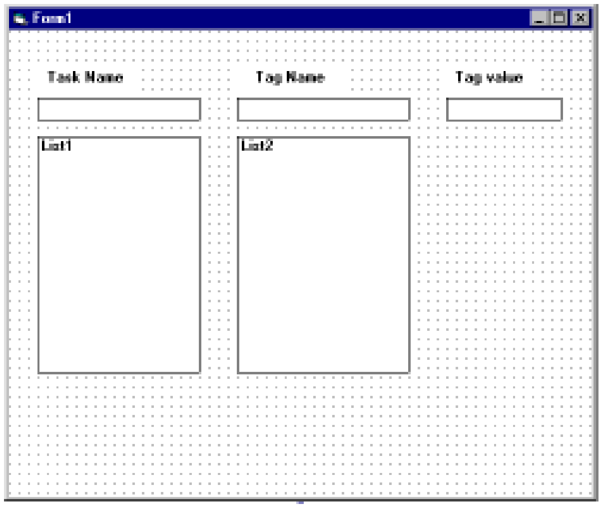


Figure 11-6: Design Your Form

There are three Edit controls named Text1, Text2 and Text3. There are two List controls named: List1 and List2.

4. Create the codes for these controls as follows:

```
    Dim DBCenter As Object
    Dim TagList As Object
    Dim TaskList As Object

Private Sub Form_Load()
    Set DBCenter = CreateObject(“GeniDAQ32.OleDB”)
    Set TagList = CreateObject(“GeniDAQ32.TagList”)

    Set TaskList = CreateObject(“GeniDAQ32.TaskList”)

    TagList.SelectTask (“ALL”)
    While Not TaskList.EndofList()
        List1.AddItem TaskList.Get()
        TaskList.GoNext
    Wend
End Sub
```

```
Private Sub List1_Click()
    Text1.Text = List1.List(List1.ListIndex)
    bOK = TagList.SelectTask(Text1.Text)
    List2.Clear
    While Not TagList.EndofList()
        List2.AddItem TagList.GetTagName()
        TagList.GoNext
    Wend
End Sub

Private Sub List1_KeyDown(KeyCode As Integer, Shift As Integer)
    Text1.Text = List1.List(List1.ListIndex)
    TagList.SelectTask (Text1.Text)
    List2.Clear
    While Not TagList.EndofList()
        List2.AddItem TagList.GetTagName()
        TagList.GoNext
    Wend
End Sub

Private Sub List2_Click()
    Text2.Text = List2.List(List2.ListIndex)
    fBuf = DBCenter.GetTagDataFloat(Text1.Text, Text2.Text, 0)
    Text3.Text = Str(fBuf)
End Sub

Private Sub List2_KeyDown(KeyCode As Integer, Shift As Integer)
    Text2.Text = List2.List(List2.ListIndex)
    fBuf = DBCenter.GetTagDataFloat(Text1.Text, Text2.Text, 0)
    Text3.Text = Str(fBuf)
End Sub
```

5. Launch GeniDAQ builder and run a project, for example demo.gni. Then execute the VB program. Select Task 1 in the Task list field, it retrieves and shows all available tags under the Task 1 in the Tag list. Then click AI1 tag, it shows its value in Tag value field.

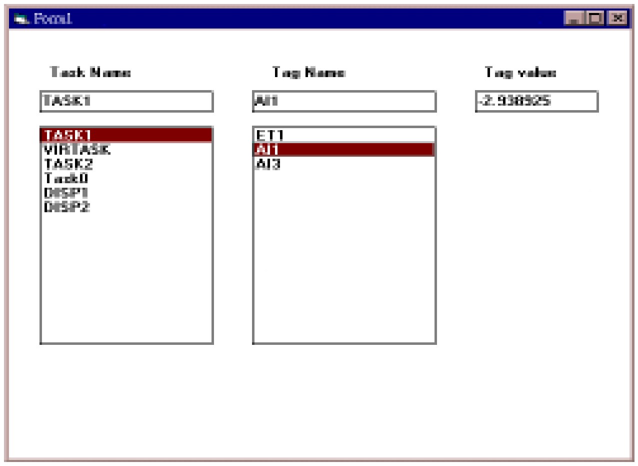


Figure 11-7: Running the Example Program

Please refer to \strategy\GoleDB example in the GeniDAQ installation directory for the details.

Type Library Source for OLE Automation Interface

```
// GniDAQ.odl : type library source for GeniDAQ.exe

// This file will be processed by the MIDL compiler to produce the
// type library (GniDAQ.tlb).

[ uuid(3C5CB3E8-ED68-11D2-BB33-0080C89003B8), version(1.0) ]
library GniDAQ
{
  importlib("stdole32.tlb");
  importlib("stdole2.tlb");

  //  Primary dispatch interface for CGniDAQDoc

  [ uuid(3C5CB3E9-ED68-11D2-BB33-0080C89003B8) ]
  dispinterface IGniDAQ
  {
          properties:
                  // NOTE - ClassWizard will maintain property information here.
                  //    Use extreme caution when editing this section.
                  //{{AFX_ODL_PROP(CGniDAQDoc)
                  //}}AFX_ODL_PROP

          methods:
                  // NOTE - ClassWizard will maintain method information here.
                  //    Use extreme caution when editing this section.
                  //{{AFX_ODL_METHOD(CGniDAQDoc)
```

```
            //}}AFX_ODL_METHOD

};

//  Class information for CGniDAQDoc

[ uuid(3C5CB3E7-ED68-11D2-BB33-0080C89003B8) ]
coclass Document
{
        [default] dispinterface IGniDAQ;
};

//  Primary dispatch interface for COleDB

[ uuid(0DBBEB27-2DFE-11D3-900C-002018650916) ]
dispinterface IOleDB
{
        properties:
            // NOTE - ClassWizard will maintain property information here.
            //    Use extreme caution when editing this section.
            //{{AFX_ODL_PROP(COleDB)
            //}}AFX_ODL_PROP

        methods:
            // NOTE - ClassWizard will maintain method information here.
            //    Use extreme caution when editing this section.
            //{{AFX_ODL_METHOD(COleDB)
            [id(1)] long GetTagDataLong(BSTR szTaskName, BSTR szTagName, short Index);
            [id(2)] float GetTagDataFloat(BSTR szTaskName, BSTR szTagName, short Index);
            [id(3)] BSTR GetTagDataSTR(BSTR szTaskName, BSTR szTagName, short Index);
            [id(4)] boolean SetTagDataLong(BSTR szTaskName, BSTR szTagName, short Index, long Data);
            [id(5)] boolean SetTagDataFloat(BSTR szTaskName, BSTR szTagName, short Index, float Data);
            [id(6)] boolean SetTagDataSTR(BSTR szTaskName, BSTR szTagName, short Index, BSTR Data);
            [id(7)] long AddTag(BSTR szTaskName, BSTR szTagName, short wType);
            [id(8)] long AddTask(BSTR szTaskName);
            [id(9)] void DeleteTask(BSTR szTaskName);
            [id(10)] void DeleteTag(BSTR szTaskName, BSTR szTagName);
            [id(11)] long ChangeTaskName(BSTR szOldTask, BSTR szNewTask);
            [id(12)] long ChangeTagName(BSTR szTaskName, BSTR szOldTag, BSTR szNewTag);
            //}}AFX_ODL_METHOD

};

//  Class information for COleDB

[ uuid(0DBBEB28-2DFE-11D3-900C-002018650916) ]
coclass OleDB
```

```
{
          [default] dispinterface IOleDB;
};

//  Primary dispatch interface for CTaskList

[ uuid(0DBBEB2C-2DFE-11D3-900C-002018650916) ]
dispinterface ITaskList
{
          properties:
                    // NOTE - ClassWizard will maintain property information here.
                    //    Use extreme caution when editing this section.
                    //{{AFX_ODL_PROP(CTaskList)
                    //}}AFX_ODL_PROP

          methods:
                    // NOTE - ClassWizard will maintain method information here.
                    //    Use extreme caution when editing this section.
                    //{{AFX_ODL_METHOD(CTaskList)
                    [id(1)] void GoTop();
                    [id(2)] void GoBottom();
                    [id(3)] BSTR Get();
                    [id(4)] void GoNext();
                    [id(5)] boolean EndofList();
                    //}}AFX_ODL_METHOD

};

//  Class information for CTaskList

[ uuid(0DBBEB2D-2DFE-11D3-900C-002018650916) ]
coclass TaskList
{
          [default] dispinterface ITaskList;
};

//  Primary dispatch interface for CTagList

[ uuid(0DBBEB2F-2DFE-11D3-900C-002018650916) ]
dispinterface ITagList
{
          properties:
                    // NOTE - ClassWizard will maintain property information here.
                    //    Use extreme caution when editing this section.
                    //{{AFX_ODL_PROP(CTagList)
                    //}}AFX_ODL_PROP
```

```
	methods:
		// NOTE - ClassWizard will maintain method information here.
		//    Use extreme caution when editing this section.
		//{{AFX_ODL_METHOD(CTagList)
		[id(1)] boolean SelectTask(BSTR szTaskName);
		[id(2)] void GoTop();
		[id(3)] boolean EndofList();
		[id(4)] void GoBottom();
		[id(5)] BSTR GetTaskName();
		[id(6)] BSTR GetTagName();
		[id(7)] void GoNext();
		//}}AFX_ODL_METHOD

};

//  Class information for CTagList

[ uuid(0DBBEB30-2DFE-11D3-900C-002018650916) ]
coclass TagList
{
	[default] dispinterface ITagList;
};

//  Primary dispatch interface for CDBCTR32

[ uuid(0DBBEB32-2DFE-11D3-900C-002018650916) ]
dispinterface IDBCTR32
{
	properties:
		// NOTE - ClassWizard will maintain property information here.
		//    Use extreme caution when editing this section.
		//{{AFX_ODL_PROP(CDBCTR32)
		//}}AFX_ODL_PROP

	methods:
		// NOTE - ClassWizard will maintain method information here.
		//    Use extreme caution when editing this section.
		//{{AFX_ODL_METHOD(CDBCTR32)
	      [id(1)] long AddTaskName(BSTR szTaskName, long pT);
	      [id(2)] long DeleteTaskName(BSTR szTaskName);
	      [id(3)] long AddTag(BSTR szTaskName, BSTR szTagName, short wDataType, short wCount);
	      [id(4)] long DeleteTag(BSTR szTaskName, BSTR szTagName);
	      [id(5)] boolean SetTagDataLongX(long lpDB, short wDataType, short Index, long Data);
	      [id(6)] boolean SetTagDataFloatX(long lpDB, short wDataType, short Index, float Data);
	      [id(7)] boolean SetTagDataSTRX(long lpDB, short wDataType, short Index, BSTR Data);
	      [id(8)] long GetTagDataLongX(long lpDB, short wDataType, short Index);
	      [id(9)] float GetTagDataFloatX(long lpDB, short wDataType, short Index);
```

```
[id(10)] BSTR GetTagDataSTRX(long lpDB, short wDataType, short Index);
[id(11)] boolean SetDataExp(long lpDB, long* pParam);
[id(12)] boolean GetDataExp(long lpDB, long* pParam);
[id(13)] long ChangeTaskName(BSTR szOld, BSTR szNew);
[id(14)] long ChangeTagName(BSTR szTaskName, BSTR szOld, BSTR szNew);
[id(15)] long GetTaskRecordPtr(BSTR szTaskName);
[id(16)] long GetTagEntryPtr(BSTR szTaskName, BSTR szTagName);
[id(17)] long GetTagEntryPtrX(long dwTagID);
[id(18)] boolean SetData(BSTR szTaskName, BSTR szTagName, long* pParam);
[id(19)] boolean GetData(BSTR szTaskName, BSTR szTagName, long* pParam);
[id(20)] boolean SetDataX(long dwTagID, long* pParam);
[id(21)] boolean GetDataX(long dwTagID, long* pParam);
[id(22)] long GetTagID(BSTR szTaskName, BSTR szTagName);
[id(23)] boolean GetDataInfo(BSTR szTaskName, BSTR szTagName, long* lpDB);
[id(24)] boolean IsTagExist(BSTR szTaskName, BSTR szTagName);
[id(25)] boolean IsTagEnabled(BSTR szTaskName, BSTR szTagName);
[id(26)] boolean IsTagEnabledX(long dwTagID);
[id(27)] boolean EnableTag(BSTR szTaskName, BSTR szTagName, bool bEnable);
[id(28)] boolean EnableTagX(long dwTagID, bool bEnable);
    [id(29)] long LockTag(BSTR szTaskName, BSTR szTagName);
    [id(30)] long LockTagX(long dwTagID);
    [id(31)] boolean UnlockTag(BSTR szTaskName, BSTR szTagName, long Key);
    [id(32)] boolean UnlockTagX(long dwTagID, long Key);
    [id(33)] boolean SetLockedData(BSTR szTaskName, BSTR szTagName, long Key, long* pParam);
    [id(34)] boolean SetLockedDataX(long dwTagID, long Key, long* pParam);
    [id(35)] boolean SetLockedDataExp(long* lpDB, long Key, long* pParam);
    [id(36)] void ClearAllLockedTag();
[id(37)] boolean IsTagLocked(BSTR szTaskName, BSTR szTagName);
[id(38)] boolean IsTagLockedX(long dwTagID);
[id(39)] boolean GetRunStatus();
[id(40)] short GetTagType(BSTR szTaskName, BSTR szTagName);
[id(41)] short GetTagTypeX(long dwTagID);
    [id(42)] long GetTaskHandle(BSTR szTaskName);
    [id(43)] boolean SetLockedTagDataLongX(long lpDB, long Key, short wDataType, short Index, long
Data);
[id(44)] boolean SetLockedTagDataFloatX(long lpDB, long Key, short wDataType, short Index, float
Data);
[id(45)] boolean SetLockedTagDataSTRX(long lpDB, long Key, short wDataType, short Index, BSTR
Data);
    //}}AFX_ODL_METHOD

};

//  Class information for CDBCTR32

[ uuid(0DBBEB33-2DFE-11D3-900C-002018650916) ]
coclass DBCTR32
```

```
  {
           [default] dispinterface IDBCTR32;
  };

  //{{AFX_APPEND_ODL}}
  //}}AFX_APPEND_ODL}}
};
```

Summary

GeniDAQ’s data center provides OLE Automation and DDE interface that allow your application to share real time data with GeniDAQ. Users can choose their favorite language to develop their applications.

12

Advantech GeniDAQ WinCE for HMI-640S Platform

Overview

Advantech GeniDAQ allows you to build your application on PCs with Windows NT/98/95, and run it on these platforms or on Advantech HMI-640S model with Windows CE. Advantech HMI-640S is a HMI platform with 5.7 inch screen size. For the detailed information, please refer to Advantech HMI-640S hardware manual.

This chapter describes how to run Advantech GeniDAQ on HMI-640S platform, including the installing Advantech GeniDAQ CE Runtime on HMI-640S, developing GeniDAQ CE strategy, downloading the strategy, configuring the devices, TCP/IP networking and running the application.

The steps to run your strategy as below:

a. Build your application with Advantech GeniDAQ Builder (V4.10 or higher) on Host PC

b. Download GeniDAQ CE strategy to HMI-640S

c. Launch \Harddisk\GeniDAQCE\AdsDeviceInstall.exe to configure and install devices.

d. Launch \Harddisk\GeniDAQCE\GeniDAQCE.exe program under My Computer icon to start the Advantech GeniDAQ CE Runtime.

Contents

- Installing Advantech GeniDAQ CE on HMI-640S
- Creating GeniDAQ CE strategy on host PCs
- Downloading GeniDAQ CE strategy to HMI-640S
- Configuring I/O devices on HMI-640S
- Configuring TCP/IP networking on HMI-640S
- Running Advantech GeniDAQ CE on HMI-640S
- Summary

Installing Advantech GeniDAQ CE on HMI-640S

Microsoft Windows CE version 2.12 and Advantech GeniDAQ CE Runtime are optional pre-installed in HMI-640S when shipping. We also provide Advantech GeniDAQ CE Runtime installation CD-ROM disc. If the program is damaged on HMI-640S, you can re-install it from the CD-ROM disc by following the steps below:

Installing Advantech GeniDAQ CE Runtime for HMI-640S via Microsoft ActiveSync

Before you begin:

Install Microsoft ActiveSync by selecting the "Install Advantech GeniDAQ CE Runtime" item.

Set up a partnership between your device and desktop computer using a serial cable, cradle, or infrared connection. For more information about setting up a partnership, see Microsoft ActiveSync Help.

If your computer is running Windows NT 4.0, you need to install the Remote Access Service (RAS).

If your desktop computer is running Windows 95, you need to install Dial-Up Networking Upgrade (DUN) 1.3 or later which is available at http://www.microsoft.com/Windows95/downloads/. The following procedures will not work with DUN 1.2. For Windows 98, it is built-in.

Install a NULL modem for your desktop computer and configure it for general use as instructed in Windows Help or your modem instructions.

For more information, please refer to readras.doc in the Microsoft ActiveSync installation directory.

Connecting a HMI-640S device to host PC

1. On HMI-640S, select Start|Programs|Communication|Remote Networking.
2. Double-click or double-tap the Make New Connection icon.
3. In the Type a name for the connection box, enter a unique name for the connection.
4. Select Direct Connection and then select Next.
5. In the Select the device field, select the COM port that connects to the host PC.
6. Click Configure button, it generates the "Device Properties" dialog box. Click Port Settings tab. We suggest to use 115200 bps for Baud rate field.
7. Select Finish to close the New Connection settings. The connection that you create appears as an icon in the Connections window.
8. Select Start|Settings|Control Panel.
9. Double-click the Communication icon. Click the PC Connection tab and change the connection to the new created connection.
10. Launch \windows\repllog.exe to setup connection.

9-pin NULL Modem Cabling

Remote Host Serial Port Connector	Calling System Serial Port Connector	Signal
3	2	Transmit Data
2	3	Receive Data
7	8	Request to Send
8	7	Clear to Send
6, 1	4	Data Set Ready and Carier Detect
5	5	Signal Ground
4	6, 1	Data Terminal Ready

For more information about setup connection, please refer to Microsoft ActiveSync on-line help.

Copying GeniDAQ CE Runtime files from host PC to HMI-640S

Using Microsoft ActiveSync, you can copy or move information from the desktop to the device and vice versa.

1. On host PC, in ActiveSync, click Windows Explorer. Then it will open the Mobile Device window for your device.
2. In Windows Explorer, browse to the GeniDAQ CE Runtime files (for example, C:\Program Files\Advantech\GeniDAQCE).
3. Right-click the files and click Copy. Place the cursor in the \harddisk\genidaqce folder for your device, right-click, and click Paste

Installing Advantech GeniDAQ CE Runtime for HMI-640S via TCP/IP Network

1. Insert the Advantech GeniDAQ CD into CD-ROM drive on host PC. The installation program will be launched automatically.
2. Select “Install Advantech GeniDAQ WinCE Runtime” item and specify the installation directory to C:\Program Files\Advantech\GeniDAQCE on Host PC to install it.
3. After installing it to host PC, share the installed directory, C:\Program Files\Advantech\GeniDAQCE directory, with other machines by right-clicking on the GeniDAQCE directory and selecting resource sharing item in the Windows Explorer.

Note: *The other way, you can transfer the files through a network server by copying all files under C:\Program Files\Advantech\GeniDAQCE directory to the server.*

4. Connect the host PC and HMI-640S to a hub or a network server.

Note: *If you use a hub for download, you should assign IP addresses for host PC and HMI-640S manually.*

5. On HMI-640S, click Start->Programs->Command Prompt menu and issue the command

[\] Net View Host_PC_Computer_Name for download via hub, or

Note: *For download via network server, issue the command*
[\] Net View Server_Name
It generates Logon to Network Server Dialog box, then inputs the user name, password and domain for login the server.

6. Then it shows the directory on the host PC or server. Then issue the command

[\] Copy \\Host_PC_Computer _Name*.* \Harddisk\GeniDAQCE, or

[\] Copy \\Server_Name\…\files

to \Harddisk\GeniDAQCE directory on HMI-640S. After copying all download files, close Command Prompt Prompt.

Creating GeniDAQ CE Strategy on Host

1. Launch Advantech GeniDAQ Builder, and click on the File/New menu to create a new strategy. A dialog box is shown. Click the Windows CE option in the Platform field, and specify the desktop size.

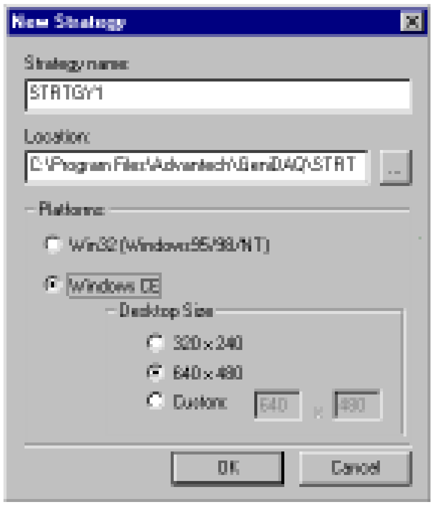


Figure 12-1: Select *Windows CE* and the screen size in the *New Strategy* Dialog Box

2. It generates a empty strategy for Windows CE platform. Note some icons are disabled for Windows CE, including BasicScript block, DDE Server and Client blocks, and conditional wavefile block.
3. After developing your application, click on the File/Save menu to save the strategy file. You have to save it with *.gce extension.

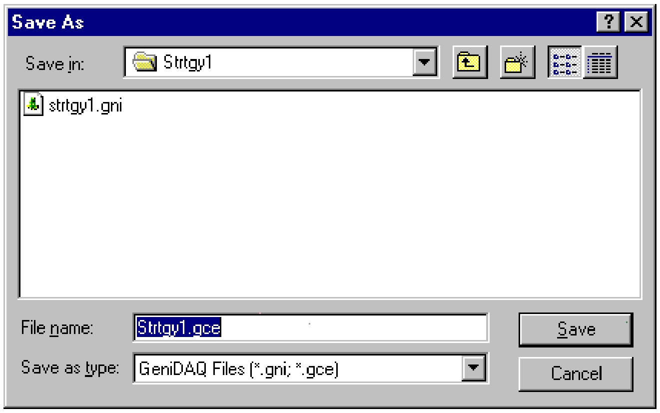


Figure 12-2: Save Your Strategy File with a *.gce File Extension

Downloading GeniDAQ CE Strategy Files to HMI-640S

After building your GeniDAQ CE strategy, you have to download it to your HMI-640S. Before you begin, you have to setup a connection between HMI-640S and host PC. Please refer to the “Connecting a HMI-640S device to host PC” section. After you setup the connection between host PC and HMI-640S, you can download the strategy by Advantech GeniDAQ builder program or Microsoft ActiveSync.

Download strategy files from host PC to HMI-640S via Advantech GeniDAQ

1. Launch Microsoft ActiveSync to setup connection between host PC and HMI-640S.
2. In Advantech GeniDAQ builder program, click File|Download menu to download it.
3. When download, you can specify to startup the strategy at booting HMI-640S.

Download strategy files from host PC to HMI-640S via Microsoft ActiveSync

Using Microsoft ActiveSync, you can copy or move information from the desktop to the device and vice versa.

1. On host PC, in ActiveSync, click Windows Explorer. Then it will open the Mobile Device window for your device.
2. In Windows Explorer, browse to the strategy files for download.
3. Right-click the files and click Copy. Place the cursor in the desired folder for your device, right-click, and click Paste

Configuring I/O Devices on HMI-640S

Advantech GeniDAQ CE supports the following devices, simulation I/O, ADAM-4000, 5000/485, Serial ModBUS RTU drivers, and serial port devices. These device drivers are built-in HMI-640S. If you want to connect to the other devices, you have to install the corresponding OPC servers for Windows CE on HMI-640S.

Connecting Devices Through OPC Interface

Before connecting to the OPC servers, you must install and/or configure your OPC server. Please refer to your OPC server documentation.

Advantech GeniDAQ CE includes two OPC servers, Advantech ADAM OPC server and Serial ModBUS RTU OPC server. Follow the steps below to configure it on Host PC.

1. Configure OPC servers by launching the ADAMOPC.EXE program or MODBOPC.EXE program on host PC, and save the configuration with the file name: ADAMOPC.TDB or MODBOPC.TDB. You must use the file name.

Note: *The ADAM OPC server name or program ID is Advantech.adam.1. It is Advantech.ModBus.1 for ModBUS OPC server.*

2. Build your strategy with Advantech GeniDAQ on host PC. Enable OPC function in I/O blocks, and connect to the OPC items.
3. Then download the OPC server configuration files, ADAMOPC.TDB and/or MODBOPC.TDB, and the strategy file to HMI-640S.

Note: *By default, these OPC server are registered on HMI-640S. If you want to register them by yourself under some condition, you can register the OPC servers (ADAMOPC.DLL or MODBOPC.DLL) by entering the following commands under \harddisk\genidaqce directory in Command prompt:*
[\]Regsrvce adamopc.dll (or modbopc.dll)
[\]Regsave

Note: *You can use the following commands to unregister the OPC servers under Command Prompt:*
[\] Regsrvce /u adamopc.dll (or modbopc.dll)
[\] Regsave

4. Run the strategy, then it can connect the devices.

Connecting Simulation I/O or Serial Port Devices

After you download your strategy to HMI-640S, you have to configure the I/O devices on HMI-640S. For simulation I/O or serial port devices, follow the procedure below to configure it.

1. Launch the device installation program (ADSDeviceInstall.exe) under \Harddisk\GeniDAQCE directory.
2. Install and configure the simulation I/O or serial port. Note that make sure the I/O settings is the same as that on host PC.

You can also configure these devices on your PC with the device installation program. Then export the device configuration to a *.reg file, and download it to HMI-640S. Finally, use device installation program to import the *.reg file on HMI-640S.

Configuring TCP/IP Networking on HMI-640S

Please follow the procedure described below to set up network connection between HMI-640S and host PC via Ethernet network.

1. Before connecting to LAN, first make sure you have properly set up your host PC on an Ethernet LAN running TCP/IP networking protocol. If you have not installed the TCP/IP network protocol on you host PC, you must install it first before joining the host PC to Ethernet LAN.
2. Make sure the TCP/IP network protocol is enabled on your HMI-640S.

Note: *If you use a CompactFlash drive which is preinstalled with Windows CE, your HMI-640S is ready for TCP/IP networking. You don't have to install other components to run TCP/IP networking*

3. Disconnect any power source from your HMI-640S.

Note: *Be sure to power off the HMI-640S before you connect or disconnect any cable.*

4. Use a twisted-pair UTP or STP cable (category 3, 4, 5) to connect the HMI-640S through its RJ-45 port to a hub (or a switch) within the Ethernet LAN, to which your host PC is also connected to.

5. Assign valid IP addresses for your HMI-640S and host PC. If you are joining an existing Intranet, ask your network administrator for valid IP addresses. If you are using a DHCP server on the network, you have just no need to assign IP addresses yourself.

Note: *To assign the IP addresses to your machines, just access Start/Settings/Control Panel/Network Properties sheet and enter valid IP addresses for your machine.*

Note: *If your network are using a DHCP server for dynamic IP address assignment, you have then no need to assign by yourself since the IP addresses will be assigned to each networking device once it is connected to the network.*

6. Enter the device name for your HMI-640S for network identification.

7. After properly establishing the IP status and the device name of your machine on the network, you must reboot to make it viable on the network.

8. After rebooting is complete, verify that your HMI-640S is funtionable within the network.

Note: *To verify that your HMI-640S has joined that network and is property connected with your host PC, just try to access your host PC thourhg the Windows CE Explorer by typing //host-name_of_host_PC in the adress bar. Press Enter to search for the host PC. If the connection is successful, you can see the network shares that is available from the host PC. Or you can simply "ping" your HMI-640S from your host PC to make sure TCP/IP is working. (e.g. c:\ping IP_address_of_your-HMI-640S or device_name_of_your_HMI-640S)*

Running Advantech GeniDAQ CE on HMI-640S

Runtime Environment

The GeniDAQ WinCE Runtime environment is shown below:

Runtime Menus

File

Setup

View

Help

After a strategy file is open, the *Runtime* menu changes to the following:

File

View

Run

Help

File menu

The **File** menu includes commands that enable you to open and close existing strategy files.

Setup menu

The **Setup** menu includes commands that enable you to setup numeric keypad, change password, administrate users and setup runtime system.

View menu

The **View** menu includes commands that enable you to display or hide toolbar, status bar and event log window.

Run menu

The **Run** menu includes commands that enable you to start, stop, resume, pause, lock, unlock, login and logout the runtime system.

Toolbar Icons

Start icon starts running the strategy

Stop icon stops the running strategy

Pause icon pauses the running strategy

Resume icon resumes the paused strategy

Lock icon locks running strategy to protect from unintended operation

Unlock icon unlocks running strategy

Login icon is used to log in to the runtime system

Logout icon is used to log out of the runtime system

Starting Runtime

You can start the GeniDAQ Runtime with the following methods.

1. Launch \Harddisk\genidaqce\genidaqce.exe program. Open the desired strategy file with the suffix ".gce", and press START icon.
2. If you want to load and run a strategy upon system boot-up, you must create a startup.ini file as below:

\GeniDAQ installed path\genidaqce.exe *.gce

For example,

\Harddisk\genidaqce\genidaqce.exe \Harddisk\genidaqce\showce.gce

Put the startup.ini file under the \Harddisk\Startup directory.

Exiting Runtime

When you have finished working in Runtime, getting back to Windows CE is performed by pressing the STOP icon. Then you can exit the GeniDAQ Runtime system by pressing File|Exit menu from the main menu.

Differences between the Win32 and WinCE Versions of Advantech GeniDAQ

Advantech GeniDAQ WinCE doesn't support the following functions:

- BasicScript function
- DDE function
- OLE Automation interface for data center
- Conditional wavefile block

In addition, the task blocks and display blocks are limited supported. Check the following tables for the support listing.

TASK Blocks

Block	Description	Win32	WinCE
[AI]	Analog Input	Yes	Yes
[AO]	Analog Output	Yes	Yes
[DI]	Digital Input	Yes	Yes
[DO]	Digital Output	Yes	Yes
[TEMP]	Temperature Measurement	Yes	Yes
[COUNT]	Hardware Counter	Yes	Yes
[ALM]	Hardware Alarm	Yes	Yes
[RS232]	RS-232 Port	Yes	Yes
[PID]	PID Control	Yes	Yes
[ON/OFF]	On/Off Control	Yes	Yes
[SOC]	Single Operator Calculation	Yes	Yes
[AVG]	Average	Yes	Yes
[EV]	Event Counter	Yes	Yes
[BS]	Basic Script	Yes	No
[TM]	Timer(need modify)	Yes	Yes
[TMS]	Time Stamp	Yes	Yes
[LOG]	Log File	Yes	Yes
[INP]	Input File	Yes	Yes
[DDEC]	DDE Client	Yes	No
[DDES]	DDE Server	Yes	No
[NETIN]	Network Input	Yes	Yes
[SALM]	Software Alarm	Yes	Yes
[BEEP]	Beep	Yes	Yes
[WAVE]	Conditional Wave File	Yes	No
[SYS]	System Control	Yes	Yes

DISPLAY Blocks

Block	Description	Win32	WinCE
[BBTN]	Binary Button	Yes	Yes
[CBTN]	Conditional Button	Yes	Yes
[MBTN]	Menu Button(need modify)	Yes	Yes
[NUMC]	Numerical Control	Yes	Yes
[KNOB]	Knob Control	Yes	Yes
[SLD]	Slider Control	Yes	Yes
[IND]	Indicator Display	Yes	Yes
[NUM]	Numerical Display	Yes	Yes
[CTXT]	Conditional Display	Yes	Yes
[BAR]	Bar Graph Display	Yes	Yes
[MET]	Anameter Display	Yes	Yes
[TRN]	Trend Graph Display	Yes	Yes
[HIST]	Historical Trend Display	Yes	No
[XY]	XY Graph Display	Yes	Yes
[CBMP]	Conditional Bitmap Display	Yes	Yes
[RECT]	Rectangle Drawing Display	Yes	Yes
[ROUND]	Rounded Rectangle Drawing Display	Yes	Yes
[OVAL]	Oval Drawing Display	Yes	Yes
[POLY]	Polygon Drawing Display	Yes	Yes
[LINE]	Line Drawing Display	Yes	Yes
[TXT]	Text String Display	Yes	Yes
[GROUP]	Group Box Display	Yes	Yes
[EVLOG]	Event Log Display	Yes	Yes

Summary

Applications for Advantech's HMI-640S model running Windows CE can be developed on computers running Windows NT/98/95. The application must then be downloaded or copied on the HMI-640S. By enabling TCP/IP networking between the HMI-640S and a host PC, you will establish real-time data acquisition. While most of the functions available in the Win32 version of GeniDAQ are also available for the WinCE version, BasicScript, DDE and OLE automation are not supported. Some task are display blocks, when used on WinCE, only support a subset of the functions supported for the Win32 version of GeniDAQ.

A

Runtime Error Code Listing

Errors and Warnings

The following is a list of possible errors and warnings that you may encounter during GeniDAQ Runtime. These error messages can aid tremendously in troubleshooting various hardware problems when running GeniDAQ.

Runtime Error/Warning Codes are as follows:

"Open communication port failed on %d"

Where **%d** is the serial communications port. This message flags a fatal error during Runtime initialization. The configured I/O device is capable of serial communications, but for some reason, the chosen communications port is not responding.

Possible causes:

1. The configuration of the driver is invalid. You may have configured the I/O device to be connected to a certain communications port that does not exist in your machine.
2. The port itself is invalid. The port may not exist in your machine. The port may be used already, such as with a mouse or other serial device.
3. The RS-232 communications port hardware is bad.

"Transmit failed on %d"

Where %d is the I/O device, such as RS-485 based ADAM module addressing.

This problem is possibly caused by bad RS-232 transmitter section hardware.

"Receive failed on %d"

Where %d is the I/O device, such as RS-485 based ADAM module addressing.

Possible causes:

1. Bad RS-232 or RS-485 bus wiring.
2. Bad remote hardware, such as a bad ADAM module or remote power supply.
3. Bad RS-232 receiver section hardware.
4. Scan rate (sample rate) is set much too fast.

"Invalid data received on %d"

Where %d is the I/O device, such as with RS-485 based ADAM modules.

1. Bad remote hardware, such as a bad ADAM module or remote power supply.
2. Bad RS-232 or RS-485 bus wiring.

"Initialize failed on %d"

Where %d is the I/O device. This error usually occurs when there is a driver software problem, such as a configuration error. However, this error can also point to the I/O hardware, such as a data acquisition card that requires programmable gain setting, etc. and checking is done by the driver to see if on-board registers have been initialized properly.

“Device reset failure on %d”

Where %d is the I/O device. The device resetting routine cannot execute properly. This error usually occurs when there is a driver software problem, such as a configuration error. However, this error can also point to the I/O hardware, such as a data acquisition card that requires programmable gain setting, etc. during board reset. Checking is done by the driver to see if on-board registers have been reset properly.

“Analog input initialization failure on %d”

Where %d is the I/O device. The Analog Input section cannot initialize properly. Usually a driver software problem, but can also point to the I/O device hardware Analog Input section, if I/O card register checking is done by the driver.

“Analog output initialization failure on %d”

Where %d is the I/O device. The Analog Output section cannot initialize properly. Usually a driver software problem, but can also point to the I/O device hardware Analog Output section, if I/O card register checking is done by the driver.

“Digital output initialization failure on %d”

Where %d is the I/O device. The Digital Output section cannot initialize properly. Usually a driver software problem, but can also point to the I/O device hardware Digital Output section, if I/O card register checking is done by the driver.

“Digital input initialization failure on %d”

Where %d is the I/O device. The Digital Input section cannot initialize properly. Usually a driver software problem, but can also point to the I/O device hardware Digital Input section, if I/O card register checking is done by the driver.

“Temperature initialization failure on %d”

Where %d is the I/O device. The Temperature section cannot initialize properly. Usually a driver software problem.Can also point to the I/O device hardware Analog Input section, if I/O card register checking is done by the driver.

“Analog input section failure on %d”

Where %d is the I/O device. Cannot receive analog input data from the I/O device. Can be a problem with the driver software. Also could be a problem in the I/O device hardware Analog Input section. However, this error can also occur if the I/O card base address set on the I/O device does not match that of the software configuration setting.

“Analog output section failure on %d”

Where %d is the I/O device. Can be a problem with the driver software. Also could be a problem in the I/O device hardware Analog Output section. However, this error can also occur if the I/O card base address set on the I/O device does not match that of the software configuration setting.

“Digital output section failure on %d”

Where %d is the I/O device. Can be a problem with the driver software. Also could be a problem in the I/O device hardware Digital Output section. However, this error can also occur if the I/O card base address set on the I/O device does not match that of the software configuration setting.

“Digital input section failure on %d”

Where %d is the I/O device. Can be a problem with the driver software. Also could be a problem in the I/O device hardware Digital Input section. However, this error can also occur if the I/O card base address set on the I/O device does not match that of the software configuration setting.

“Temperature section failure on %d”

Where %d is the I/O device. Cannot receive analog input (temperature) data from the I/O device. Can be a problem with the driver software. Also could be a problem in the I/O device hardware Analog Input section. However, this error can also occur if the I/O card base address set on the I/O device does not match that of the software configuration setting.

“Device not found”

I/O device is not properly installed. Either the Strategy Editor I/O Icon Block (AI, AO, DI, DO, or Temperature block) is not properly configured, or the I/O Device does not exist. Configure the block and save the strategy, or enter the Advantech Device Installation Utility and configure the device.

“No XXX function supported on %d”

Where %d is the I/O device and XXX is one of the I/O functions. Either the driver or GeniDAQ does not support an I/O device’s function, or the I/O device does not support a function that the driver or GeniDAQ is trying to access during Runtime. ALWAYS a software problem, since the driver knows all supported functions, and GeniDAQ queries the driver for the supported device features.

“Timer Overrun, slow down the sampling rate”

The computer cannot process one complete scan of the strategy in the time allowed in the Scan Task setup. Allow more time for your scan task.

“Not enough memory”

Memory allocation error. Try to free up memory by doing less multi-tasking, install more memory, use a good memory manager program, etc.

“File not found”

Occurs when trying to access a file, such as a log file, data file, or strategy file.

“Configuration data lost”

Occurs when there is a corrupted or missing device configuration in the Windows registry. It contains specific configuration information for all of your installed I/O devices. If it is bad or missing, you must re-create it again.

B

Glossary

Glossary

Actuator

E device that activates process control equipment by using pneumatic, hydraulic, or electronic signals. For example, a valve actuator is used to control fluid rate for opening and closing valves.

A/D Converter

Analog-to-digital converter. A circuit or device used for producing a set of digital output signals representing the magnitude of a voltage applied to its input. The resolution of the device is proportional to the number of its digital output bits. For instance, a 16-bit A/D converter is higher in resolution than a 12-bit A/D.

Add

To add a device means to increase the number of I/O devices of the same type as the installed device driver. When a device is added to the system, only one driver is installed (using the device DRIVERS utility provided in the Control Panel, Main Window). Configuration information is then added by using the Advantech Device Installation program. You may have more than one I/O device of the same type installed in a system at one time. To add an I/O card, for instance, you would press the ADD button in the Advantech Device Installation Program and then configure the base address, and possibly other parameters.

Analog

In electrical quantities having the property of varying in a continuous, rather than incremental or discrete-step manner.

C, Centigrade, Celsius

Zero degrees = Freezing and 100 degrees = Boiling point of water at sea level.

CJC, Cold Junction Compensation

If two wires of different metals are connected end to end, there are two junctions formed. Current will flow in the resulting circuit if one junction is at a different temperature than the other (Seebeck Coefficient). This effect is the same for either junction except for polarity. Call one of the junctions the measuring junction. Separate the other junction and connect the two leads to a current meter. When making temperature measurements, if the current produced by this other junction (cold junction) is ignored, an unknown error is created. If the temperature of the cold junction is noted at the same time as a measurement is made, then the error from the cold junction can be added or subtracted from the reading to give a correct answer.

Automatic cold junction compensation is accomplished by sensing the terminal temperature (cold junction) with an RTD. The RTD is in a circuit that produces a current equal and opposite to that produced by the cold junction. Thus the current change from the cold junction plus that from the compensation circuit cancel one another. Once this is accomplished, it can then be assumed that the current meter reading represents the current produced by the measuring junction only.

Comp Loop

An extra pair of wires going to the tip of an RTD but not connected to the element, a novel way of lead wire resistance compensation.

Configure

To configure an I/O device is to set the parameters for use with the software the same as those set on the actual I/O device. The values set in the device-specific dialog box should reflect those of the switches and jumpers you have set on the I/O device, board, or card. When an instance of a device is added, it must be configured before it can be used with the software.

Controller, Temperature

A device or software program capable of receiving a signal from a temperature sensing probe within a process and regulating an input to that process in order to maintain a selected temperature (control point).

Conversion Rate

The number of analog-to-digital (A/D) conversions (samples) performed per second.

Counts

The number of events, or events counted by the event counter. The event counter increments or decrements whenever a rising edge of a digital signal is sensed at the counter input.

D/A Converter

A device that converts digital information from the computer into a corresponding analog voltage or current. This allows the computer to control real world events. Analog outputs may directly control equipment in a process that is then measured by an analog input. It is possible to perform closed loop or PID control with the D/A function. Analog outputs can also generate waveforms (function generator). The resolution of the device is proportional to the number of its digital input bits. For instance, a 16-bit D/A converter is higher in resolution than a 12-bit D/A.

Deadband (Hysteresis)

In a digital (on/off) controller, there may be one switching point at which the signal increases and another switching point at which the signal decreases. The difference between the two switching points is called hysteresis or deadband.

Differential Input

A signal-input circuit where SIG LO and SIG HI are electrically floating with respect to analog ground (I/O device analog ground, which is normally tied to digital ground). This allows the measurement of the voltage difference between two signals tied to the same ground and provides superior common-mode noise rejection.

F (Fahrenheit)

32 degrees = Freezing and 212 degrees = Boiling point of water at sea level.

Hold

An external input which is used to stop the process (event counter, ramp, A/D, etc.) temporarily, freezing the device's output at the current value.

Hz

Frequency in cycles per second pulses per second, events per second, etc.

Impedance

Resistance to electrical flow in an AC circuit. It is designated by the symbol Z and is expressed in ohms.

I/O Device

An I/O device is a hardware device capable of data input and output. Generally, this would encompass Analog to digital Conversion (A/D), Digital to Analog conversion (D/A), and Digital Input and Output. The devices capable of such I/O can be in the form of plug-in I/O cards and/or remote devices. The I/O device's hardware should be configured (if necessary) first, and then the software can be configured to match the hardware's settings. Some I/O devices can be configured directly through the software's settings. Check your hardware manufacturer's manual for how to configure the hardware. After any hardware configuration is done, the software configuration can be set up by use of the Advantech Device Installation Program. The device driver should have been previously installed using the DRIVERS program in the CONTROL PANEL (Main Window).

Input Resistance

Resistance measured across the input terminals with the signal leads disconnected.

Install

To install a device means to:

1. Install its device driver in WINDOWS, using the device DRIVERS installation utility provided in the Control Panel, Main window.
2. Once the driver is installed, devices of the driver's type (instances) may be installed (set up or configured), and added by using the Advantech Device Installation Program.

Instance

An instance of an I/O device is a device that has been added and configured uniquely. For instance, there may be three Advantech PCL-818 multi-I/O cards installed in a system. Each PCL-818, installed at separate base addresses and having different parameters configured for each, is an "instance" of the PCL-818 driver (DLL) that was installed in WINDOWS.

K (Kelvin)

The basic temperature unit of the thermodynamic scale, symbol K. Zero degrees K = zero degrees C - 273.16.

Measuring Junction

That junction of a thermocouple subjected to the temperature to be measured.

Multiplex

A technique which allows different input (or output) signals to use the same lines at different times, controlled by an external signal. Multiplexing is used to save on wiring and I/O ports.

Overshoot

The ratio of the over-travel of the output of a controller beyond a new steady state to the change in steady state when a new constant value of the measured quantity is suddenly applied (step input).

Range

The span of values over which a device will function without entering an overload condition.

Reference Junction

The other junction (usually at ice point) to which the measuring junction thermocouple junction is compared. The output voltage of a thermocouple is approximately proportional to the temperature difference between the measuring (hot) junction and the reference (cold) junction.

Remove

To remove a device means:

- Once the driver is installed, devices of the driver's type (instances) may be removed, by highlighting the listing in the dialog box of the Advantech Device Installation Program and pressing the remove button.

To remove the driver means:

- Remove the device's driver from WINDOWS, using the device DRIVERS utility provided in the Control Panel, Main window.

Resolution

The degree to which nearly equal values of a quantity can be discriminated. In analog devices, the difference between the values represented by two adjacent divisions. In digital values, the value represented by a one-digit change in the least-significant digit.

Response Time

The time necessary for a device (sensor, A/D, D/A) to reach 63.2% of a step change in measured quantity (temperature, voltage, etc.)

RTD

Resistance Temperature Detector — sensor, bulb, transducer; precision winding of copper, nickel, balco (nickel-iron), platinum (industry standard), or tungsten element used for temperature measurement. Connected via 2, 3, or 4 wire hook-ups.

Secondary Junction

An unwanted connection between a pair of thermocouple wires tending to produce a signal representative of the secondary junction temperature rather than the measuring junction temperature.

Settling Time

The time taken for the display to settle within one digit final value when a step is applied to the A/D input.

Setup

To set up an I/O device is to set the parameters for use with the software the same as the settings of the actual I/O device. The values set in the device-specific dialog box should reflect those of the switches and jumpers you have set on the I/O device, board, or card. Alternatively, if you are using a software programmable device, the device can be configured directly through the device-specific dialog box (in most cases).

Signal Conditioner

A circuit module that offsets, attenuates, linearizes, or filters the signal for input to the A/D converter. The typical output span of a signal conditioner is +/- 5VDC.

Single Ended Input

Amplifier with one input referenced to ground.

Temperature Limit

The full capability of the system from the lowest point to the highest point: limited by the sensor.

Temperature Span

Those two points anywhere within the temperature limit to which the signal conditioner/amplifier can be calibrated. FORMULA: Maximum temperature - minimum temperature = span.

Temperature Stability/Instability

The unwanted change (error) of an instrument, sensor, amplifier, etc. caused by changes in the temperature surrounding it. Usually expressed as the total change between two temperature limits, or % error/degree C or F.

Thermocouple

Two dissimilar metals with a voltage output proportional to temperature. ANSI types:

Type	Composition	Max Degrees F
J	Iron-Constantan	2192
K	Chromel-Alumel	2501
T	Copper-Constantan	752
E	Chromel-Constantan	1832
R	Platinum-Plat.13%Rhodium	3214
S	Platinum-Plat.10%Rhodium	3214
B	Plat.6%Rhod.-Plat.30%Rhod.	3308
C	Tu 5%Rhenium-26%Rhenium	5000

Thermocouple Break Protection

A safety feature to indicate when a thermocouple has failed in an open circuit condition. Its purpose is to eliminate the possibility of an ambiguous reading. In the case of a temperature controller, it eliminates the dangerous condition of thermal runaway.

Transducer

A device which converts temperature, pressure, level, length, position, etc. into a voltage, current, frequency, or pulses, etc.

Wheatstone Bridge

A full resistance two (2) wire bridge with RTD, power source, zero and sensitivity adjustments balanced at some reference temperature. Heating or cooling causes a resistance change and discrete circuit unbalance, which indicates the temperature. Various RTD bridge network connections use 2, 3, or 4 wire hook-up arrangements, depending on the accuracy required in the temperature measurement. These are designed to balance out lead wire resistance between the sensor and the bridge. Accuracy obtained is usually:

2 wire +/- >=0.5% (0.5-50 degrees C)

3 wire +/- >=0.25-0.5% (0.25-0.5 degrees C)

4 wire +/- >=0.15-0.25% (0.1-0.25 degrees C)

C

ADAM OPC Server

Introduction

The Advantech ADAM OPC Server is a driver for both the OPC Client test function and a real working ADAM-4000, ADAM-5000/485 data acquisition and control module OPC Server. This ADAM OPC server was implemented using advanced programming concepts from the most current version of the OPC specification for use in developing next generation industrial software applications.

Key Features of the ADAM OPC Server

- Advanced OPC data quality and data conversion to client’s request
- Supports multi-drop ADAM-4000, ADAM-5000/485 I/O devices
- Uses the concept of groups for easy configuration and manageability
- Support all popular PLC data types, such as WORD, LONG, FLOAT, INT
- Internally simulated for configuration and testing
- Tag multiplier lets you create hundreds of tags in seconds
- OPC sample client for rapid testing of your OPC data connections
- GUI interface for viewing devices, tags, groups, and realtime signals
- Full online help and documentation
- Online configuration of devices, groups and tags
- Flexible raw and engineering units and signal scaling

System Configuration and Installation

System Requirements for Windows 95/NT

- IBM PC compatible with Pentium 133 or higher
- 32 MB RAM
- 10 MB disk space
- Microsoft Windows 95 with DCOM, Microsoft Windows 98 or NT4.0.

Hardware Support

This OPC Server driver supports ADAM-4000 and ADAM-5000/485 series data acquisition modules. A cable and wires must be present to connect the user’s computer to ADAM-4000 and ADAM-5000/485 series data acquisition modules.

Supported ADAM-5000/485 series data acquisition modules are: ADAM-5013, ADAM-5017, ADAM-5017H, ADAM-5018, ADAM-5024, ADAM-5050, ADAM-5051, ADAM-5052, ADAM-5056, ADAM-5060, ADAM-5068, ADAM-5080, ADAM-5000E.

Supported ADAM-4000 series data acquisition modules are: ADAM-4011, ADAM-4011D, ADAM-4012, ADAM-4013, ADAM-4014D, ADAM-4016, ADAM-4017, ADAM-4018, ADAM-4018M, ADAM-4021, ADAM-4050, ADAM-4052, ADAM-4053, ADAM-4060, ADAM-4080, ADAM-4080D.

Installing the ADAM OPC Server Under Windows 98/95/NT

GeniDAQ version 4.1 and higher includes the OPC server. It is installed and registered on the system when GeniDAQ is installed. You can skip the installation and registration steps below.

1. Insert the Advantech ADAM OPC disk #1 in the 3.5-inch disk drive.
2. Click **Start**, and choose **Run** in the Windows NT or 98/95 environment.
3. In the *Run* dialog box, type the following (replacing “A” with the actual location of the 3.5-inch disk drive):

   `A:\Setup`

4. Follow the instructions in the setup program. The setup program will ask you for the folder where most of the program files will be copied.
5. The setup program will also ask you for the program folder.
6. At the end of the installation, click **OK** to view the readme file and launch the OPC client application.

Registering the OPC Server

If the ADAM OPC Server is not registered in the Windows environment, you have to register it manually. The steps to register the ADAM OPC Server are listed below:

1. Open a DOS command prompt window.
2. Type in the “***ADAMOPC /regserver***” command at the DOS prompt to execute it.

The ADAM OPC Server will be registered into the Windows system. If you want to unregister the ADAM OPC Server, type in “***ADAMOPC /unregserver***” command in DOS prompt window..

Note: *As explained in the installation section of this manual, Windows NT 4.0 or Windows 98/95 with DCOM is required to run the ADAM OPC server.*

Install ADAM OPC Server at Windows CE

1. Insert the Advantech ADAM OPC disk #1 into the 3.5-inch disk drive.
2. Copy ADAM OPC Server DLL file and TDB file (configuration file) to the application software directory. (It is recommended that you create a dedicated sub-directory in the application software directory to store DLL and GDB files).
3. Use a text editor to view the ***readme.txt*** file.

Note: *The file name for ADAM OPC Server configuration file at Windows CE device must be “ADAMOPC.TDB”.*

Registering OPC Server Service

If the ADAM OPC Server is not registered in the Window CE environment, you have to register it manually. The steps to register the ADAM OPC Server are listed below:

1. Invoke the Command prompt window. (You can press *Ctrl + Esc* to invoke the command execution dialog).
2. Type in the “***Regsvrce ADAMOPC***” command in command prompt mode and execute it.

The ADAM OPC Server will be registered into the Window CE system. If you want to unregister the ADAM OPC Server, type in the " ***Regsvrce ADAMOPC /u***" command in the command prompt window.

Quick Start

You can retrieve channel data from any ADAM module listed above by using the following three step configuration:

- **Step 1**: Add New Device
- **Step 2**: Add New Group
- **Step 3**: Add New Tag

Suppose you want to retrieve the analog input from an ADAM 4011 that uses address 5, and you use COM1 to connect your computer to the device. Under these conditions, you can perform the following procedure:

Step 1: Add New Device

1. To add a new device, select **Add | New Device** from the main menu or push the corresponding button on the toolbar:

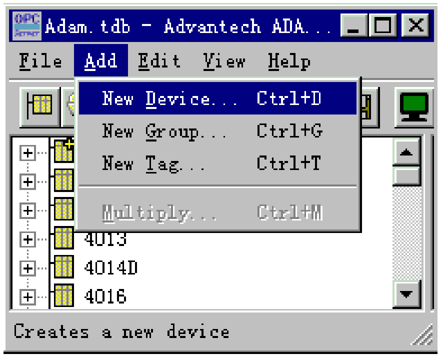


Figure C-1: Creating a New Device from the Main Menu

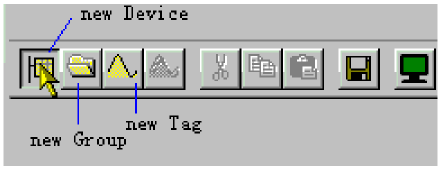


Figure C-2: Creating a New Device from the New Device Toolbar Icon

2. Then the *Device Properties* dialog appears:

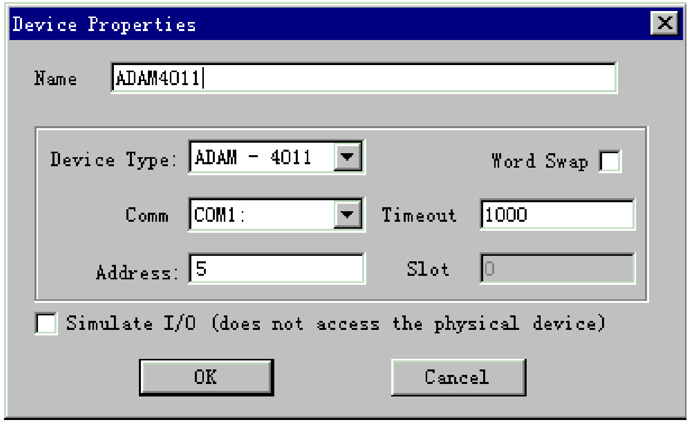


Figure C-3: *Device Properties* Configuration Dialog Box

Type the name of the new device, for example 'ADAM4011'. Select the represented device module from the *Device Type* combo box, choose 'ADAM – 40011'. Specify the COM port of the PC node where the newly-added device is connected, for example, 'COM1:', and set the device address in this COM port. After doing this, click **OK**.

Step 2: Add New Group

After adding the new device (ADAM4011), you should add a new Group for the device . The Group is used as a container of I/O tags. To add a new Group, select **Add | New Group** from the main menu or click the **New Group** icon on the toolbar. When the *Group* dialog appears, type in the group name (for example, "Analog Input") and click the **OK** button.

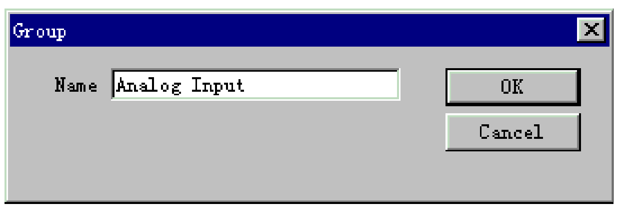


Figure C-4: Type the Group Name in the *Group* Dialog Box

Step 3: Add a New Tag

Select the added group on the left side of the dialog window and right-click the mouse. Select **New Tag** from the pop-up context menu to add a new tag.

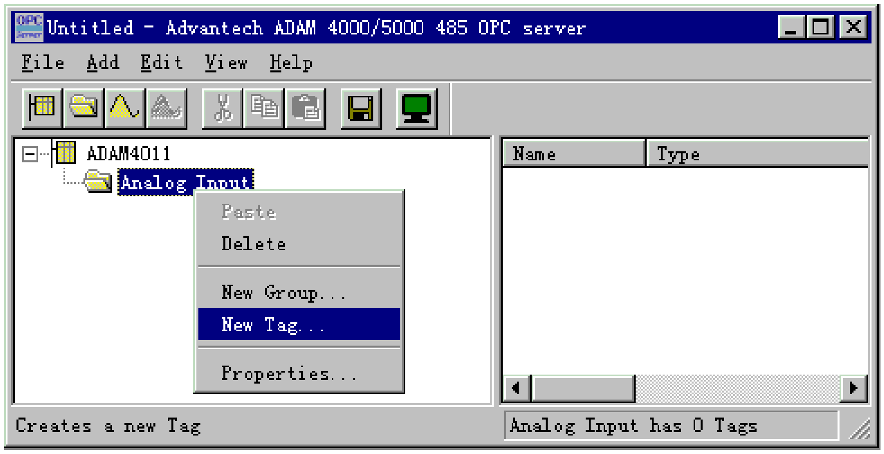


Figure C-5: New Tag Pop-Up Context Menu

The *Tag Properties* dialog box will be displayed as below:

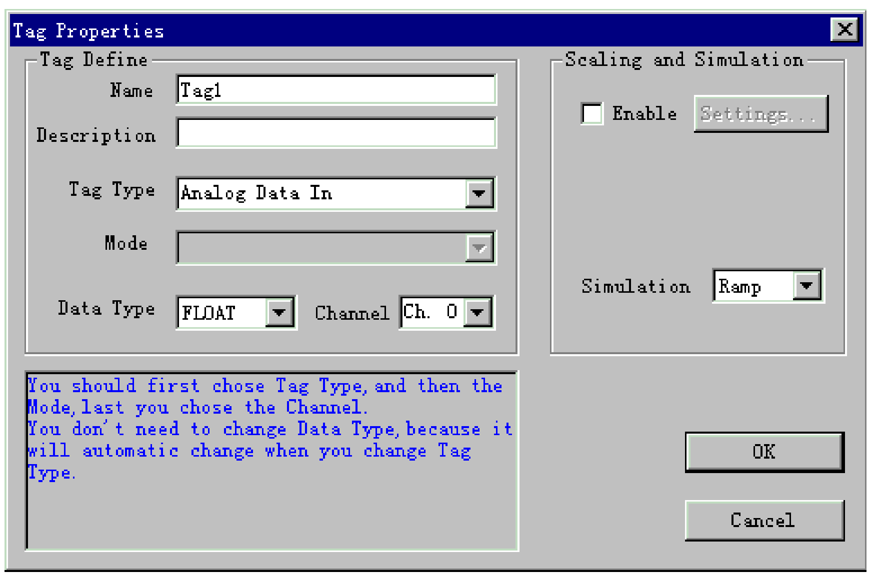


Figure C-6: Tag Properties Configuration Dialog Box

Input the tag name and description for the added tag. Select the specified tag type from the *Tag Type* combo box. For example, choose *Analog Data In* for the ADAM-4011 device that you added. The *Data Type* will change automatically based on the selected tag type. It is not recommended to change the data type. After that, specify the channel number of the modules in the system if you use the ADAM-5000/485 distributed data acquisition and control system. If the added device is an ADAM-4000 device, the *Channel* field would be dedicated to “Ch. 0” (channel 0) only.

After configuring the "Device", "Group" and "Tag" of the new device, choose **View | Monitor** from the main menu of the ADAM OPC Server. The real-time value of the analog input channel of the ADAM 4011 is displayed in the tag view (on the right side of the OPC Server dialog window) dynamically.

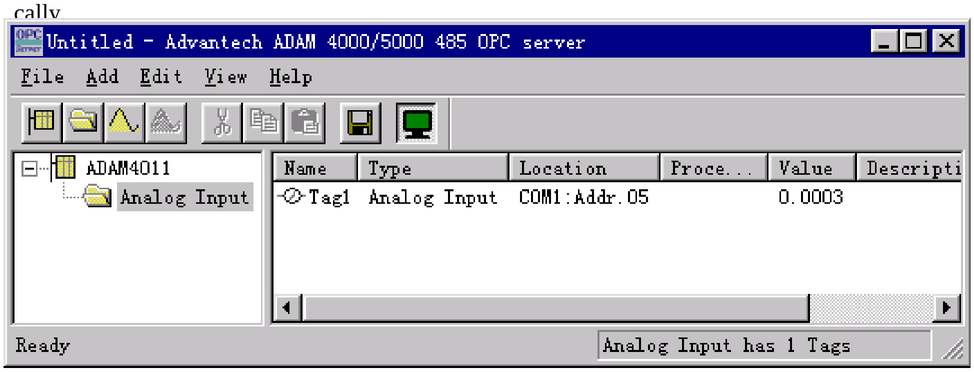


Figure C-7: Real-time Value of the Analog Input Channel

OPC Server Configuration

OPC Server Tool

The ADAM OPC Server tool is your main configuration utility for setting up and maintaining the ADAM I/O driver. It provides fields for specifying the properties of devices, groups and tags.

Features

- Key features of the ADAM OPC Server:
- Advanced OPC data quality and data conversion to client request
- OPC server utilizes advanced free-threading capabilities.
- Supports Multiple Groups for easy configuration and manageability
- Read/write functionality
- Tag multiplier lets you create hundreds of tags in seconds
- GUI interface for viewing tags, groups, and real time signals
- Full online help
- Change device, group and tag properties online
- Flexible engineering units and signal ranges

Access Methods

From the Windows Start menu:

- Select **Programs** from the **Start** menu.
- Select **Advantech ADAM OPC Server** from the **Programs** group
- Select the **ADAMOPC** execution file from the **Programs** submenu.

Using the Tool's Browser

The Tree Browser displays a hierarchical list of the I/O driver and its devices, groups and tags. The I/O driver appears at the top of the tree.

Tool Tree Browser

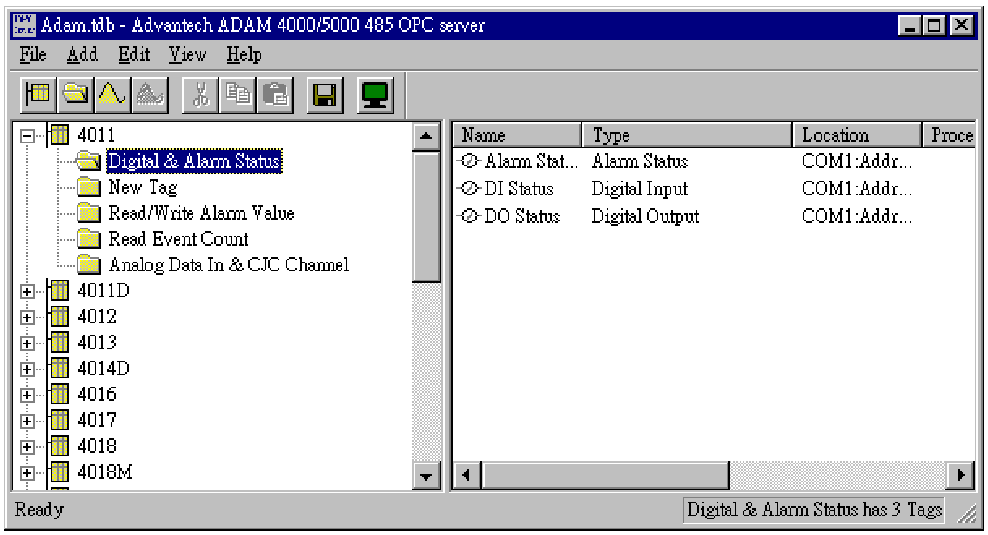


Figure C-8: ADAM OPC Server Tool Tree Browser

When you select an item in the Tree Browser, its properties display in the *Properties Viewer*. You can choose to view the item's configuration or statistics properties by clicking buttons on the Run-time toolbar.

Changing Items in the Tree Browser

When you add or modify devices, groups or tags in the OPC Server Tool, changes are made immediately to the I/O Server. Changes you make to the driver configuration while working with the OPC Server Tool automatically display in the Tree Browser.

Refreshing the Tree Browser

To view changes made from another client application (such as another OPC Server Tool accessing the server or a custom client application accessing the server), you must refresh the Tree Browser display by selecting an item in the Tree Browser.

Collapsing and Expanding the Tree Browser

You can collapse or expand the tree under an item by double-clicking it.

Navigating in the Tree Browser

Navigating through the Tree Browser can be done by selecting items with a mouse or by using the keyboard. Use the up or left arrow keys to move up in the Tree Browser. Similarly, use the down or right arrow keys to move down in the Tree Browser. You can also press a letter key to jump to the nearest item that begins with that letter.

Additional Tree Browser Features

Connection lines show the relationship between devices, groups and tags by displaying which devices are on a channel and which tags belong to a device. The plus and minus buttons indicate whether items are fully expanded or collapsed. The plus button shows the item is collapsed and the minus buttons indicates that the item is expanded. For example, a device with a plus sign next to it means that there are groups and possibly tags configured on that device.

The Menu Bar

The Tool menu bar includes a title bar, a Minimize button, a Maximize button, a Control-menu box, and the menus you can use to configure the driver. The menu bar is initially displayed at the top of the screen but you can resize it and drag it to another location.

The Power Tool has the following menus:

- File
- Add
- Edit
- View
- Help

You can customize the Tool's appearance by dragging the toolbars or the Tree Browser to the location you want. You can also make the toolbars or the Tree Browser float above the Tool by dragging them to the center or the screen. Later, you can dock them or resize them, as needed.

Using Shortcut Keys

The following is a list of shortcut keys for working with the I/O Driver Power Tool:

- **<Ctrl>-<N>:** Opens a new I/O driver configuration file
- **<Ctrl>-<O>:** Allows you to open an existing file
- **<Ctrl>-<S>:** Saves the current file
- **<Ctrl>-<D>:** Add a new device
- **<Ctrl>-<G>:** Add a new group
- **<Ctrl>-<T>:** Add a new tag
- **<Ctrl>-<M>:** Add multiple new tags
- **<Ctrl>-<X>:** Cut
- **<Ctrl>-<C>:** Copy
- **<Ctrl>-<V>:** Paste
- **Del:** Delete
- **<Ctrl>-<P>:** Properties

Using the File Menu

The following commands appear on the File menu.

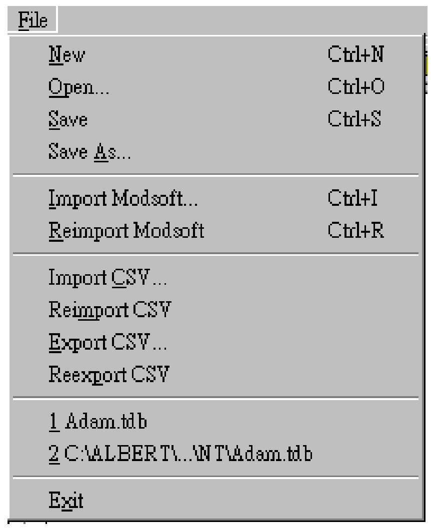


Figure C-9: ADAM OPC Server's File Menu

New

Lets you make a new server configuration file. Keyboard shortcut: <Ctrl>-<N>.

Open

Lets you open an existing server configuration file. You can select TDB file types. Keyboard shortcut: <Ctrl>-<O>.

Save

Saves the current server configuration file to the default path for configuration files with the name you specify. The default path for configuration files is the same path where you installed the server. You can change the default path by entering a new location in the *Default Path* tab of the Tool's Setting Defaults for I/O Driver Configuration File Name and Path.

If you save a new server configuration file, the ***Save As*** dialog box prompts you to enter a name for your server configuration file. Keyboard shortcut: <Ctrl>-<S>.

Save As

Lets you enter a new name and file type for the current server configuration.

Save As Dialog Box Options

- **Save In Field:** Lets you select the directory that you want to store the file in.
- **File Name Field:** Lets you save a file with a new name, or in a different location, by entering a new file name in the *File Name* field or by selecting a new directory in the *Save In* list. To save a file with an existing file name, select the name in the list or enter the current name.
- **Save as Type Field:** Lets you specify the type of file you want to save the configuration as:

Import CSV...

Lets you import CSV type file to be current server configuration.

Reimport CSV...

Lets you re-import a CSV type file to update the current server configuration.

Export CSV...

Lets you export current server configuration to a CSV type file.

Reexport CSV...

Lets you re-export current server configuration to update the CSV type file.

Exit

Exits the OPC Server Tool.

Using the Add Menu

The commands that appear in the **Add** menu are for creating and modifying server configuration files. These commands correspond with the buttons on the Tool's Configuration toolbar.

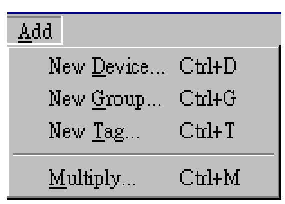


Figure C-10: ADAM OPC Server's Add Menu

New Device...

Lets you add a new device configuration.

New Group...

Lets you add a new group configuration to group-related tags in one device.

New Tag...

Lets you add a new tag configuration in one device.

Multiply...

The tag multiplier provides an easy and fast method for creating many tags without having to individually enter all of them.

Using the Edit Menu

The commands that appear in the **Edit** menu are for cutting, copying, pasting, deleting and modifying configuration data. You also can configure COM port in this menu.

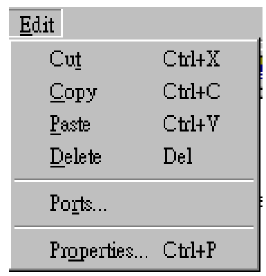


Figure C-11: ADAM OPC Server Edit Menu

Cut

Lets you cut selected tag.

Copy

Lets you copy the selected tag.

Paste

Lets you paste cut tags to the device.

Delete

Lets you delete the selected tag.

Ports...

Lets you define the configuration of selected COM port.

Properties...

Lets you define the configuration of selected devices, groups and tags.

Using the Help Menu

The commands that appear in the Help menu are for displaying the ADAM OPC Server online help and version number.

Figure C-12: ADAM OPC Server Help Menu

About ADAM...

Displays version and program information about ADAM modules.

Help Contents

Displays online help assistance for the ADAM OPC Server.

Configuring the I/O Driver with the Tool

To configure the ADAM OPC Server with the Tool:

1. Click the **New** button in the **File** menu to create a new configuration file
2. Click the **New Device** button in the **Add** menu to add a new device to the Tree Browser.
3. Click the **New Group** button in the **Add** menu to add a new group for the selected device.
4. Click the **New Tag** button in the **Add** menu to add a new tag for the selected group.
5. Modify the fields in the *Properties Viewer* as needed.

To modify the fields in the *Properties Viewer*:

1. Select a device, group or tag from the Tree Browser and click the **Properties** button in the **Edit** menu. The fields for the selected item appear in the *Properties Viewer*.
2. Edit the fields you want to change.

Adding and Modifying Devices

To add a new device to your server configuration:

1. Click the **Add Device** button on the **Add** menu of the configuration toolbar. The new device appears in the Tree Browser and the fields for entering device properties appear in the *Device Properties* dialog.
2. Enter the properties for the new device. Edits to a field do not take effect until you remove the focus (or cursor) from the field and press the **OK** button.

To modify an existing device:

1. Select the device you want to modify from the Tree Browser.
2. Select specified device and click on the **Properties** button in the **Edit** menu bar. The *Device Properties* dialog will be displayed for device modification.
3. Edit the device's fields as needed.

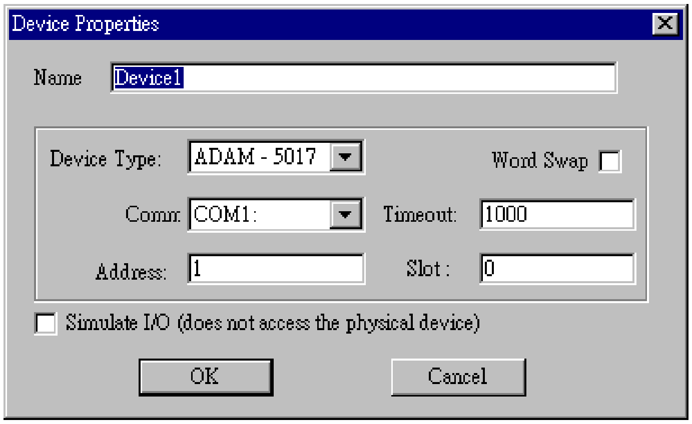


Figure C-13: Device Properties Configuration Window

Device Name

Specifies the name of the added or modified device. Valid Entries: *Up to 12 alphanumeric characters*

Device Type

Specifies the hardware type of the selected device. This property is used to indicate which kind of device is used. Valid entries are ADAM – 4011, ADAM - 4011D, ADAM – 4012, ADAM - 4013, ADAM - 4014D, ADAM - 4016, ADAM - 4017, ADAM - 4018, ADAM - 4018M, ADAM - 4021, ADAM - 4050, ADAM - 4052, ADAM - 4053, ADAM - 4060, ADAM - 4080, ADAM - 4080D, ADAM - 5013, ADAM - 5017, ADAM - 5017H, ADAM - 5018, ADAM - 5024, ADAM - 5050, ADAM - 5051, ADAM - 5052, ADAM - 5056, ADAM - 5060, ADAM - 5068, ADAM – 5080.

COMM Port

Specifies which physical COM port to use for the selected channel. You can specify as many channels as necessary for communication with your hardware.

Valid Entries

- COM1 to COM2 (if available): Computer ports
- COM3 to COM8: Expansion ports
- Any valid COM port name: Expansion ports

Important: Verify that the COM port you select is not used by another channel or application. Assigning two channels to the same port results in a communication failure on one of the channels. Assigning a channel to a COM port used by another application (such as an alarm printer) can produce problems with driver communication.

Timeout

Specifies how long the I/O driver waits for a response from the selected device. The base of the timeout field is milliseconds. For example, if you specify 1000 in this field, the server will wait for a response about 1000 milliseconds (equal to 1 second). Valid entries are *1 ~ 65535*.

Slot

Specifies the primary slot number of the selected device in ADAM-5000/485 system. Valid entries are *0 to 3* and *NONE.*

Address

Specifies the address number of the selected device in the RS-485 communication line. Valid entries are *0 to 255* and *NONE.*

Simulation I/O

Specifies the device to be a virtual device. It does not connect to any physical devices. But it does provide a simulation signal to the server. Valid entries are *Enabled* and *Disabled.*

To delete an existing device

1. Select the device you want to delete from the Tree Browser.
2. Click on the **Delete** button in the **Edit** menu.

Adding and Modifying Tag Groups

To add a new group into the selected device:

1. Select the device to which you want to add a tag group from the Tree Browser.
2. Click the **New Group** button on the **Add** menu of the configuration toolbar. The new group appears in the Tree Browser and the fields for entering the group properties appear in the *Group Properties* dialog window.
3. Enter the group name for the new tag group. Edits to a field do not take effect until you remove the focus (or cursor) from the field and press the **OK** button.

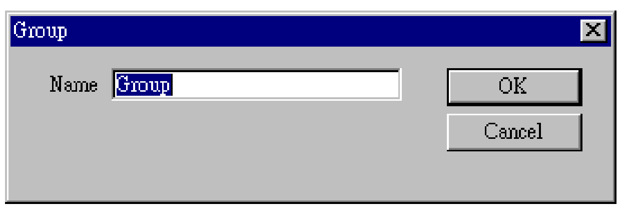


Figure C-14: Ground Name Configuration Dialog Box

To modify an existing group:

1. Select the group you want to modify from the Tree Browser.
2. Select the **Properties** button from **Edit** menu. The *Group Properties* dialog window will be displayed for modification.

To delete an existing group:

1. Select the group you want to delete from the Tree Browser.
2. Click on the **Delete** button in the **Edit** menu.

Adding and Modifying Tags

To add a new tag into selected device

1. Select the group and device to which you want to add a tag from the Tree Browser.
2. Click the **New Tag** button on the **Add** menu of the configuration toolbar. The new tag appears in the workspace on the left of the window. The fields for entering tag properties appears in the *Tag Properties* dialog window.
3. Enter the tag name for the new tag. Edits to a field do not take effect until you remove the focus (or cursor) from the field and press the **OK** button.

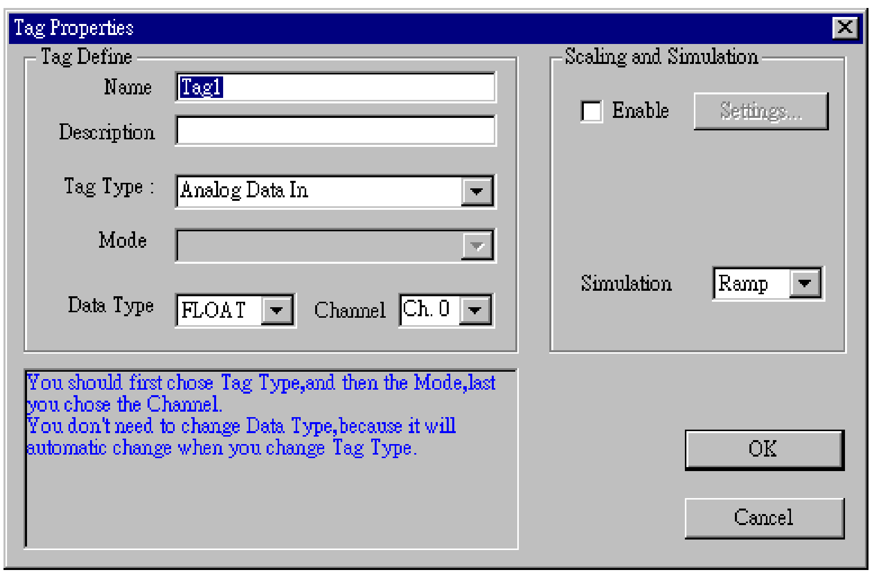


Figure C-15: Tag Properties Configuration Dialog Box

To modify an existing tag

1. Select the tag you want to modify from the Tree Browser.
2. Click on the **Properties** button from the **Edit** menu. The *Tag Properties* dialog box will be displayed for tag modification.
3. Edit the tag's fields as needed:

Tag Name

Specifies the name of the added or modified I/O tag. Valid entries are *up to 12 alphanumeric characters.*

Tag Description

Contains text about the selected tag. Entries in this field can be very helpful when you look forward to the connection of I/O tag and physical I/O points. The more detailed and specific the information you enter in this field, the easier it will be to identify the I/O at a later date. Valid entries are u*p to 40 alphanumeric characters and symbols.*

Tag Type

This property indicates what kind of data that the tag represents. Valid entries are Analog Data In, Analog Data Out, Digit Data, Digit Data In, Digit Data Out, CJC Channel Data, Event Count Data, Digital & Alarm Status, Alarm Status, High Alarm Limit, Low Alarm Limit, Alarm Mode Setting, High Alarm Mode Setting, Low Alarm Mode Setting, High Alarm Enable Setting, Low Alarm Enable Setting, Disable Alarm Setting, Counter Data, Counter Max. Count, Counter Initial Count, Counter Start Control, Counter Overflow Flag, Counter Alarm Limit, Counter Alarm Enable Setting, Counter 0 Alarm Status, Counter 0 Hi Alarm Limit, Counter 0 HiHi Alarm Limit, Counter 0 Alarm Enable Setting, Counter 0 Alarm Mode.

Mode

Specifies the method of communication for the selected channel.

Note: Please notice that this field is not enabled at this OPC Server.

Data Type

Specifies the tag's default data type. The driver uses this data type for the tag if you do not specify a database block hardware option. Valid entries include Int, Long, Float, String, Bit, Unsigned Long.

Channel

This property indicates which data channel the data block represents. Valid entries are *Ch. 0*, Ch. 1, *Ch. 2, Ch. 3, Ch. 4, Ch. 5, Ch. 6, Ch. 7*.

Scaling & Simulation

This group is used for I/O simulation. It will generate I/O signals automatically without connecting hardware. If you define the device to be a simulation I/O, the tag belonging to the device would be defined as a simulation signal.

- **Enabled:** The range of the input value from the simulation signal would be re-scaled to be the setting range. The **Setting** button will be active while this field is enabled. Click on the **Setting** button. A *Tag Process Setting* dialog box will be displayed for input scaling values. You can select the conversion type to be *Linear* or *Square Root*.

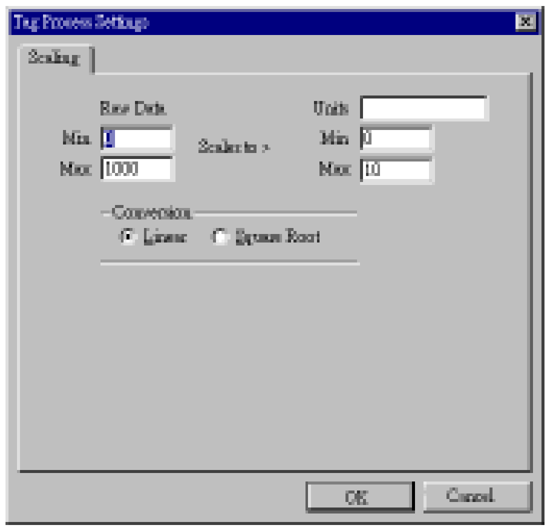


Figure C-16: Tag Process Settings Configuration Dialog Box

- **Simulation Type**: There are three simulation signals offered. These simulation signals are *Sine*, *Ramp*, and *Random*.

Configuring the I/O Driver for Windows CE

The ADAM OPC Server Windows CE version is an in-process server. If you use the ADAM OPC server Windows CE version, you should first create and configure this server in the Windows NT environment. After configuration, download MODBUS RTU OPC Server Window CE DLL file and the configuration file (TDB file) to the Window CE target platform.

Note: The file name for ADAM OPC Server configuration file at Windows CE device must be "ADAMOPC.TDB".

Using OPC Client

An OPC Client application, provided with the ADAM OPC Server, has several methods for rapidly connecting your servers. The OPC Client is able to browse the registry of a PC and display a complete list of all installed OPC Servers. It also provides real live data feedback and OPC Server browsing capabilities.

The OPC Client is also helpful for connecting and testing other 3rd party OPC applications connected to same server.

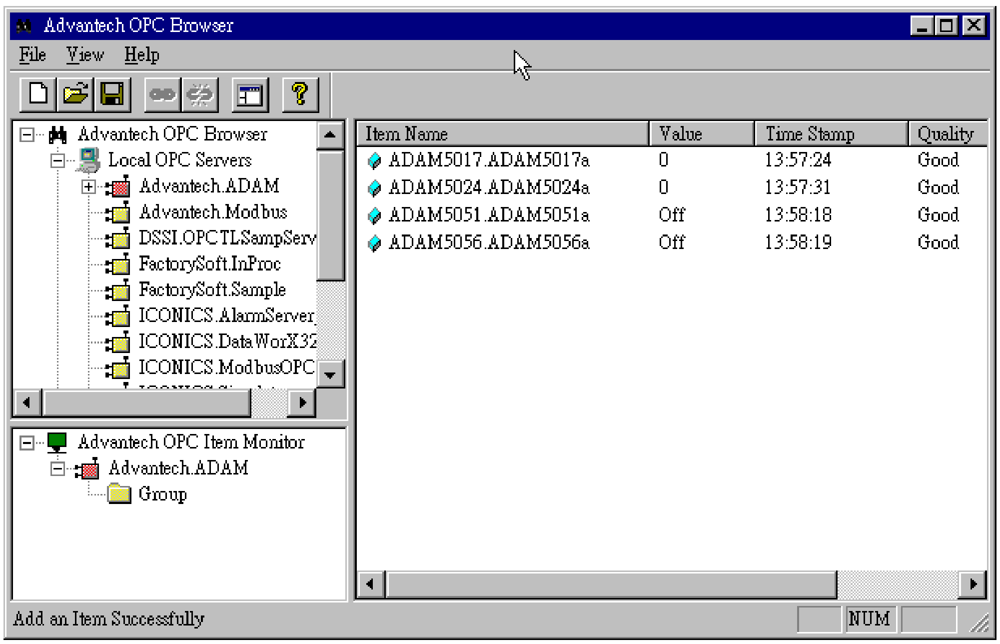


Figure C-17: OPC Client

Features

- Setup dialog box for defining the default name and default setting for configuration files.
- Tree Browser for an overall view of your system setup.
- Moveable Tree Browser and toolbars.

Connecting the OPC Server

When OPC servers are installed to the system, they are registered so that clients can find them and users can view them in a list. To make a client/server connection, the user must first choose a server. The server name selected (for example, Advantech.ADAM) is used to get a class ID which, in turn, is used to create a COM object. If the user selects a server that is not currently running, the system starts the server and then creates the object in that server on behalf of the client.

Once the COM object is created, the client application has an IOPCServer interface, as defined in the OPC specification. This is the main interface to the OPC server and this document refers to this as a Server interface. (The other interface is Group.) This OPC client always creates a group and registers a device interface with it to get asynchronous data notification.

When an item is added, the dialog displays either a hierarchy or a flat list of names, depending on the server. The names are queried from the Server object using the filter string and requested data type. When the user either types or selects a name, an item by that name is added to the Group object. This item is also read immediately to get an initial value.

Items in a group are scanned by the server; when their values change, the device interface in the client is notified. A data structure containing the data for each item whose value or quality has changed (and only those items) is passed to the client device interface. The client unpacks and uses the data.

Server Status and Group Parameters

The *Server Status* dialog box periodically queries the server object for status and displays the results. The *Group Parameters* dialog queries the group state and displays the results. The **OK** or **Apply** buttons in the *Group Parameters* dialog box writes the parameters from the dialog to the Group object and reads the parameters back. This primarily controls the scanning and update of data. When a group is inactive, it does not send data notifications to the client and, typically there is no reason to scan the items when the group is inactive. The *Update Rate* in the *Group Parameters* dialog box specifies the rate at which data notifications should be sent back to the client, assuming that data has changed. This is also the rate at which items are scanned on behalf of this client.

To write a value to an item, select the item in the *OPC Client* windows and choose **Write Value to Item** from the **OPC** menu, The client writes the value typed in the *Write Item Value* dialog box to the correct item in the Group object. The method of writing data is determined by the synchronous check box. When data is written synchronously, the call to the server blocks until the operation has completed, which may take a long time. When data is written asynchronously, the call to the server returns quickly and the operation is carried out on another thread. When the write has finished, the client devise interface is notified with the results.

The user can disconnect from the selected server by choosing **Disconnect** from the **OPC** menu, The **Disconnect** command unregisters the device interface, releases the Group object, and then releases the Server object. Releasing an object means that the client is no longer interested in the object, so the system can delete the object in the server.

Configuring the OPC Client

The OPC Client is used as a test case to debug an OPC Compliant Server and access some of the OPC variables and parameter configuration.

1. Start the OPC Client.

Figure C-18: Starting the OPC Client

2. Select *Advantech OPC Items Monitor* on the bottom left of the OPC Browser and right-click the mouse. You can add and connect the OPC Server to this browser.

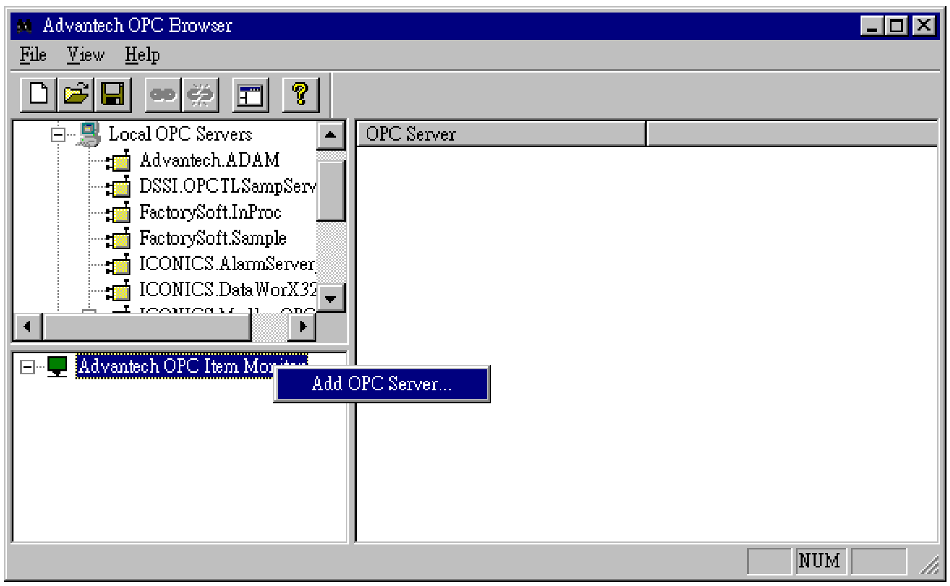


Figure C-19: Adding an OPC Server

3. Select *Advantech ADAM OPC Server* and click **OK**. This connects the OPC Client to the ADAM OPC server.

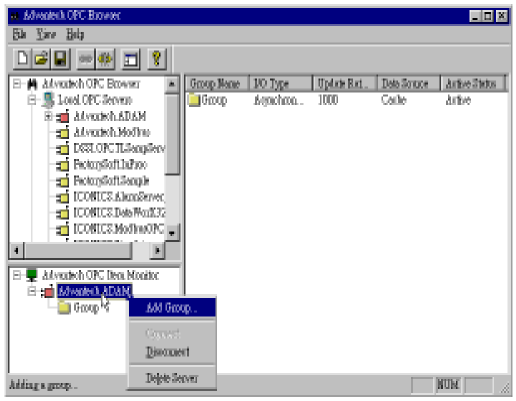


Figure C-20: Connecting the OPC Client to the ADAM OPC Server

4. Select *Advantech ADAM OPC server* and right-click the mouse. You can add Group for the connected OPC Server to the OPC Client. The *Add Group* dialog box appears, as shown below:

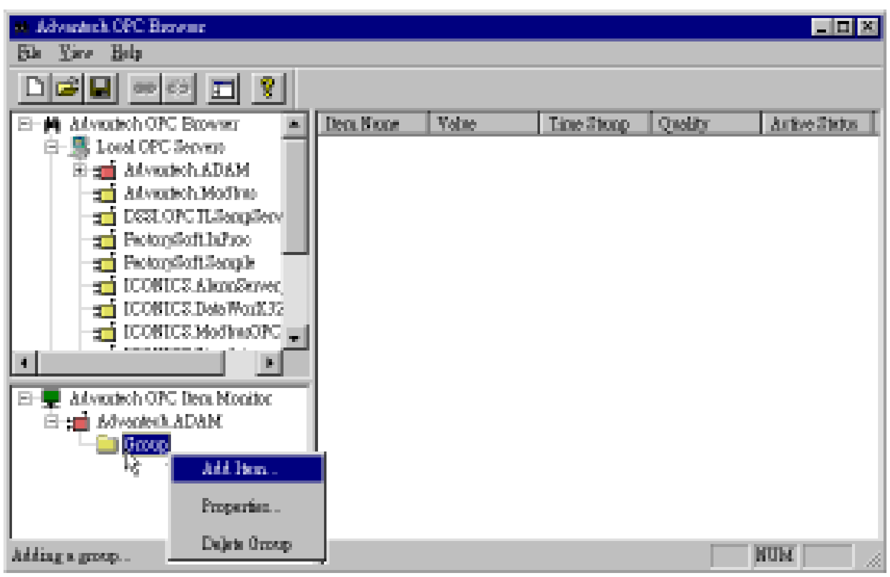


Figure C-21: Adding a Group for the OPC Server Connected to the OPC Client

5. After adding the group, you can add items for each OPC group. Select the dedicated OPC group and right-click the mouse. You can add an *Item* for the connected OPC Server to the OPC Client. *The*

Add Item dialog box appears, as shown below:

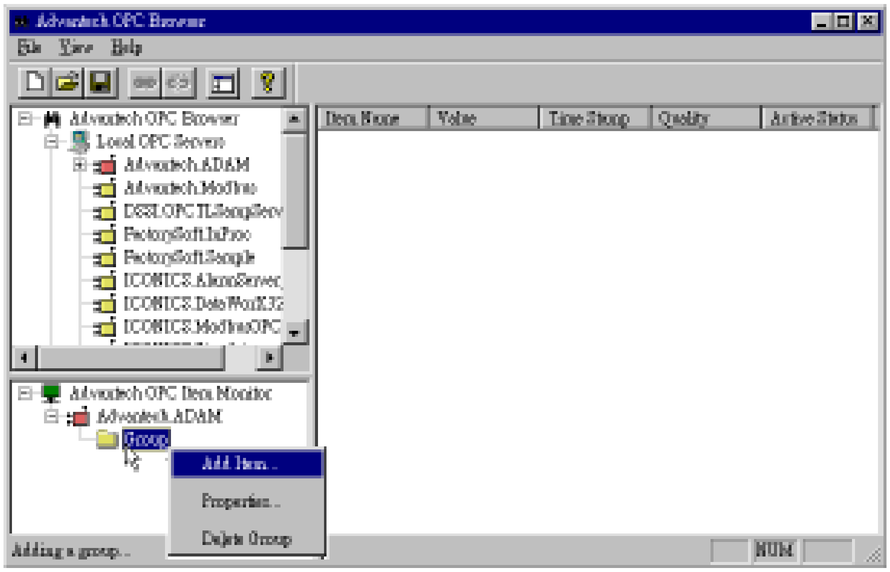


Figure C-22: Add Item Dialog Box

6. The *Add Item* dialog box displays the devices, groups, and tags defined in the current server configuration. You can select an item name of connected OPC server and OPC client's *Item ID* will be generated automatically.

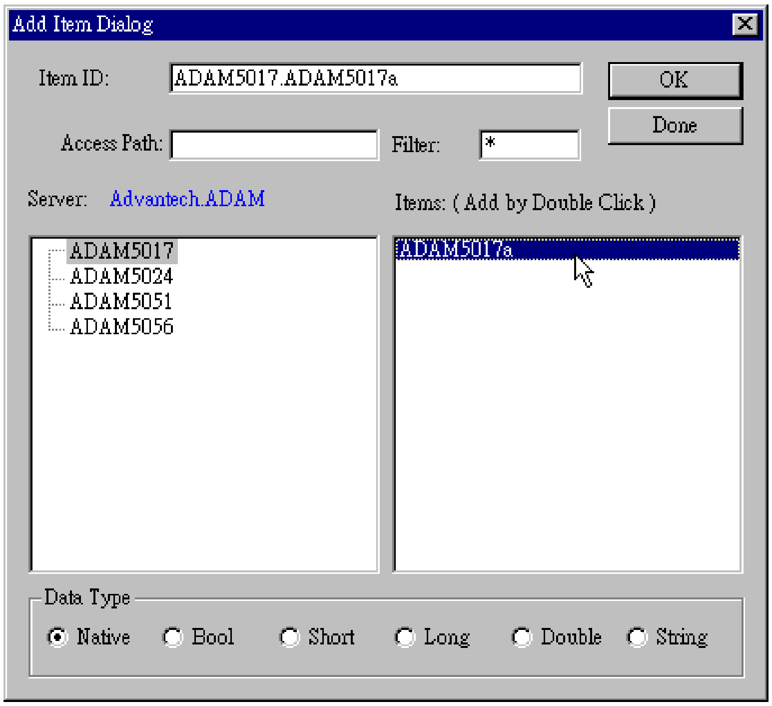


Figure C-23: Add Item Configuration Dialog Window

In the *Browse Items* list, select the device, group, and tag. The full name appears in the *Item Name* field. For example, "ADAM5017.ADAM5017a". To add more tags, just repeat the previous steps.

Accessing the OPC Server

After connecting the OPC server and configuring the linkage, OPC server data will be displayed in the *Item* window (at the right side of OPC client window) immediately. The OPC server data value is automatically updated in the *OPC Client Item* window. Beside that, you can also read or write data values to the OPC server manually.

The steps to read or write data value to OPC server manually are:

1. Select the specific OPC item.
2. Right-click the mouse to invoke the OPC item's function menu.
3. Select the **Read/Write** menu option.

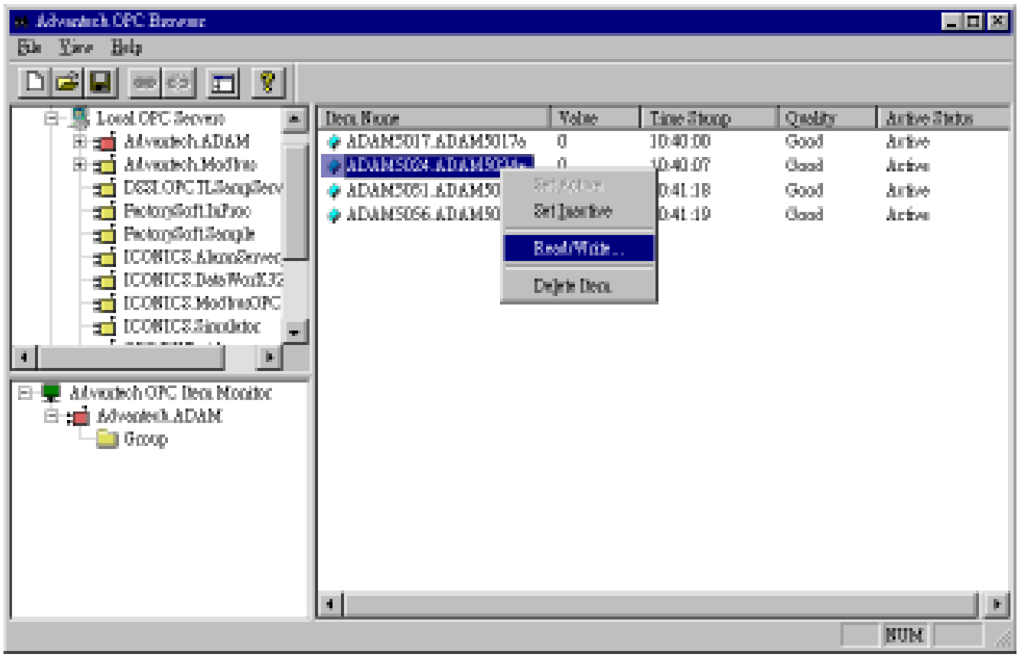


Figure C-24: Selecting the Read/Write Menu Item

4. Click the **Read** button in the *Read/Write Item Value Dialog* window and you will get the current value of the specific OPC item in the next field.

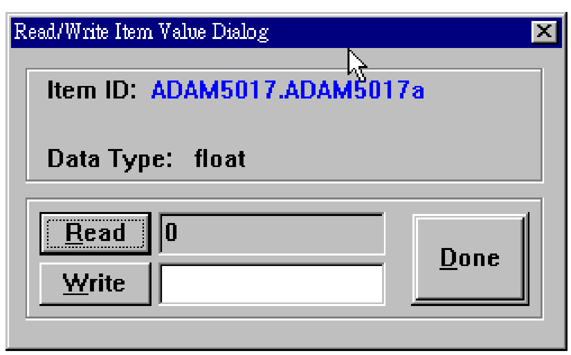


Figure C-25: Read/Write Item Value Dialog Box

5. If you want to write data values to a specific OPC item, key in the output value in the blank field near the **Write** button and click the **Write** button. This output value will be sent to the OPC server directly.

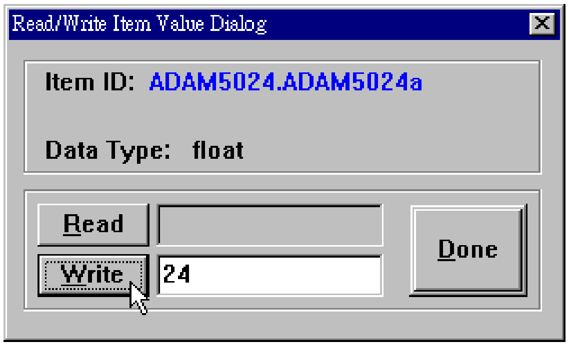


Figure C-26: Read/Write Item Value Dialog Box

6. If you want to exit the Read/Write operation, click the **Done** button and you will return to the OPC client window.

Summary

The Advantech ADAM OPC Server is a driver for both the OPC Client test function and a real working ADAM-4000, ADAM-5000/485 data acquisition and control module OPC Server. This OPC Server driver supports ADAM-4000 and ADAM-5000/485 series data acquisition modules which are connected to a user's computer via a cable and wires.

The ADAM OPC Server tool is your main configuration utility for setting up and maintaining the ADAM I/O driver. It provides fields for specifying the properties of devices, groups and tags.

D

Serial ModBUS OPC Server

Introduction

The Advantech Modbus RTU OPC Server was implemented using advanced programming concepts of the most current version of the OPC specification (Version 2.0) for use in developing next generation industrial software applications.

The Advantech Modbus RTU OPC Server shows how to easily communicate with OPC clients and control devices. This Modbus RTU OPC server contains a popular Modbus protocol and can be connected to real world Modbus compatible I/O hardware.

Key Features of the MODBUS RTU OPC Server

- Advanced OPC data quality and data conversion to the client's request
- OPC server utilizes advanced free-threading capability of the Modbus server
- Supports multiple multidrop I/O devices
- Support several device types (384, 484, 584, 884, 984, Micro84, Modbus and Modcell devices)
- Uses the concept of "groups" for easy configuration and manageability
- Supports RTU and ASCII device protocols
- Support all popular PLC data types, such as WORD, LONG, FLOAT, INT
- Internally simulated for configuration and testing
- Tag multiplier lets you create hundreds of tags in seconds
- OPC sample client for rapid testing of your OPC data connections
- GUI interface for viewing devices, tags, groups, and realtime signals
- Full online help and documentation
- Online configuration of devices, groups and tags
- Flexible raw and engineering units and signal scaling

System Configuration and Installation

System Requirements for Windows 95/NT

- IBM PC compatible with Intel Pentium processor at 133 MHz or faster
- 32 MB RAM memory
- 10 MB disk space
- Microsoft Windows 95 with DCOM or Microsoft Windows 98 or NT4.0.

Hardware Support

This OPC Server driver supports Modbus compatible I/O hardware. A cable and wires must be present to connect the user's computer to Modbus compatible I/O hardware.

Installing MODBUS RTU OPC Server on Windows 95/NT

GeniDAQ version 4.1 or higher includes the OPC server. It is installed and registered on the system when GeniDAQ is installed. You can skip the installation and registration steps below.

1. Insert the Advantech Modbus RTU OPC Server disk #1 into a 3.5-inch disk drive.
2. Select **Run** from the Windows Start menu and type the following in the *Run* dialog box (replacing "A" with the actual letter of the 3.5-inch disk drive):

   `A:\Setup`

3. Follow the instructions of the setup program. The setup program will ask you to select a folder where most of the files will be copied.
4. When the installation program finishes, click the **OK** button to view the readme file and launch the OPC client application.

Note: *As explained in the installation section of this manual, Windows NT 4.0 or Windows 95 with DCOM is required to run the Modbus RTU OPC server.*

Note: *Internet Explorer 4.0 installs DCOM automatically. However, if using Internet Explorer 3.0, DCOM is not provided and can be downloaded from Microsoft's web site at www.microsoft.com.*

Registering the OPC Server

If the MODBUS RTU OPC Server is not registered in the Windows environment, you have to register it manually. The steps to register MODBUS RTU OPC Server are listed as below:

1. Invoke the DOS prompt window.
2. Type in "***MODBOPC/regserver***" command in DOS prompt mode and execute it.

MODBUS RTU OPC Server will be registered to Windows. If you want to unregister the MODBUS RTU OPC Server, type in the "***MODBOPC/unregserver***" command in a DOS prompt window.

Note: *As explained in the installation section of this manual, Windows NT 4.0 or Windows 95 with DCOM is required to run the MODBUS RTU OPC server.*

Install MODBUS RTU OPC Server in Windows CE

1. Insert the Advantech MODBUS RTU OPC disk #1 into the 3.5-inch disk drive.
2. Copy the MODBUS RTU OPC Server DLL file and TDB file (configuration file) to the application software directory. (You are recommended to create a dedicated sub-directory in the application software directory to store DLL and GDB files)
3. Use a text editor such as Notepad.exe to view the readme.txt file.

Note: *The file name for the MODBUS RTU OPC Server configuration file in the Windows CE device must be "MODBOPC.TDB".*

Registering the OPC Server

If the MODBUS RTU OPC Server is not registered in the Window CE environment, you have to register it manually. The steps to manually register the MODBUS RTU OPC Server are shown below:

1. Invoke a Command prompt window. (you can press *Ctrl + Esc* to invoke the command execution dialog box).
2. Type "***Regsvrce MODBOPC***" command in command prompt mode and execute it.

MODBUS RTU OPC Server will be registered to the Windows CE system. If you want to unregister the MODBUS RTU OPC Server, type the "***Regsvrce MODBOPC /u***" command in the command prompt window.

Quick Start

You can retrieve channel data from any MODBUS RTU module listed above by using the following four-step configuration:

- **Step 1**: Set COM port parameters
- **Step 2**: Add a new device
- **Step 3**: Add a new group
- **Step 4**: Add a new tag

Suppose you want to retrieve the analog input from the MODBUS RTU 4011 that has address 5, and you use COM1 to connect your computer to the device. Do the following:

Step 1: Add a New Device

Advantech ModBUS RTU OPC Server connects the control device through the COM port. You have to define correct parameters for the COM port connected to the control device. Select **Edit | Ports** from the main menu and the following dialog box is displayed. Configure the parameters as follows:

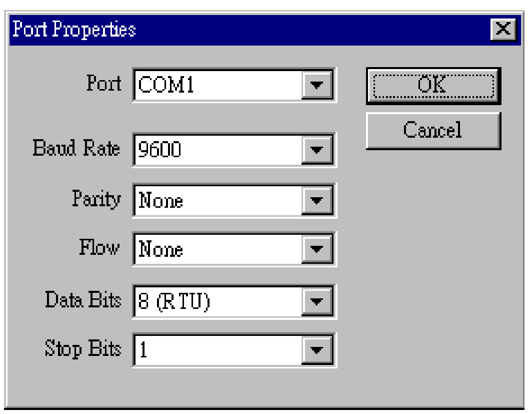


Figure D-1: Port Properties Configuration Dialog Box

Step 2: Add New Device

To add a new device, choose **Add | New Device** from the main menu or push the corresponding button on the toolbar:

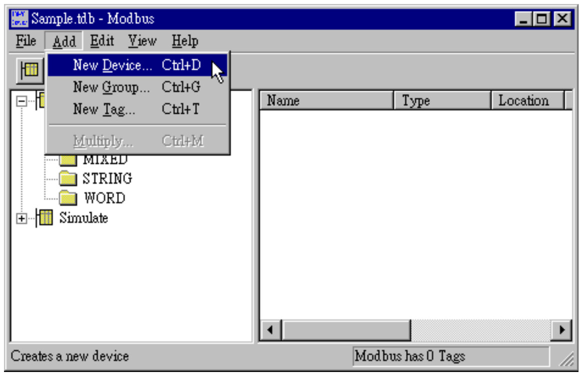


Figure D-2: Select Add | New Device From the Main Menu

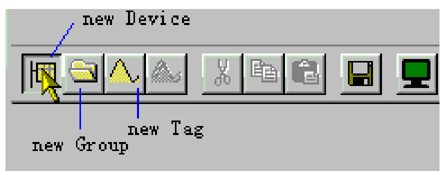


Figure D-3: Click the New Device Icon on the Toolbar

The *Device Properties* dialog box appears:

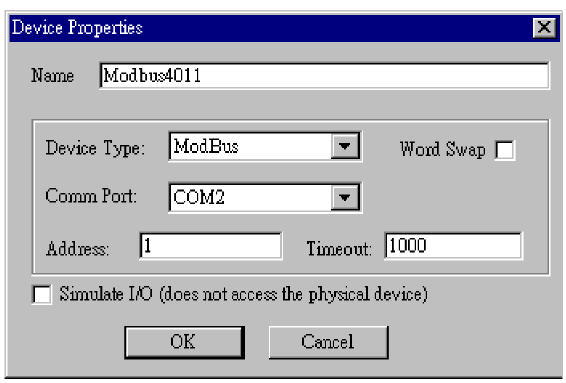


Figure D-4: Device Properties Configuration Dialog Box

Type in the name of the new device, for example 'MODBUS4011'. Select the represented device module from the *Device Type* combo box and choose 'MODBUS'. Specify the COM port of the PC node of the newly-added connected device, for example, 'COM2', and set the device address to this COM port. After doing this, click **OK**.

Step 3: Add a New Group

After adding the new device (MODBUS RTU4011), you should add a new Group for the device . The Group is used as a container of I/O tags. To add a new Group, select **Add | New Group** from the main menu or click the **New Group** icon on the toolbar. When the *Group* dialog appears, key in the group name (for example, “Analog Input”) and click the **OK** button.

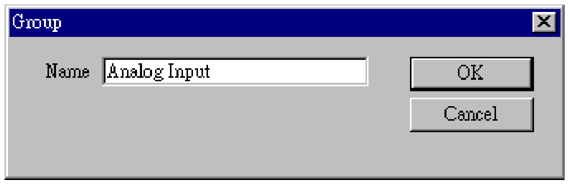


Figure D-5: Group Dialog Box Configuration Window

Step 4: Add a New Tag

Select the added group on the left side of the dialog window and click the right button of the mouse. Click **New Tag** from the pop-up context menu to add a new tag. The *Tag Properties* dialog will be displayed as shown below:

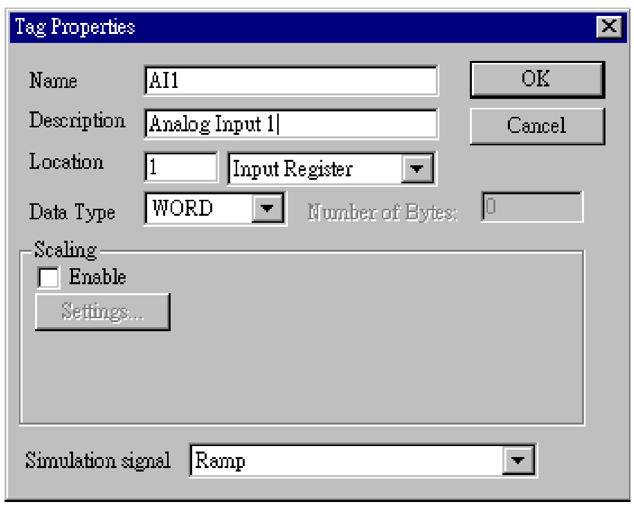


Figure D-6: Tag Properties Configuration Dialog Box

Input the tag *Name* and *Description* for the added tag. Select the specified tag type from the *Location* combo box. For example, choose the *Input Register* type and set the location to be *1* for the added AI1 tag. The offset address of the tag will be generated automatically. We do not suggest that you change the offset address. After that, specify the data type of this tag, for example *WORD*, for the analog input data.

After completing the settings of the *Device*, *Group* and *Tag* of the new device, select **View | Monitor** from the main menu of the MODBUS RTU OPC Server. The real-time value of the analog input channel of MODBUS4011 is displayed in the tag view (on the right side of the *OPC Server* dialog window) dynamically.

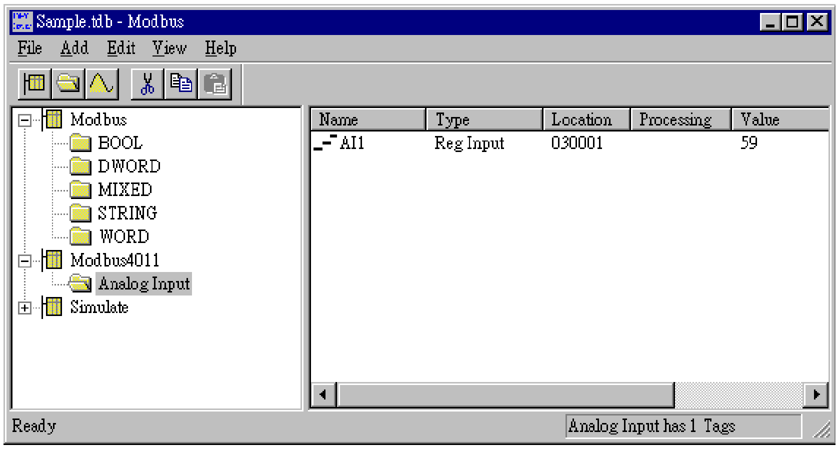


Figure D-7: ***OPC Server*** **Dialog Window**

OPC Server Configuration

OPC Server Tool

The MODBUS RTU OPC Server tool is your main configuration utility for setting up and maintaining the MODBUS RTU I/O driver. It provides fields for specifying the properties of devices, groups and tags.

Features

The OPC Server is extremely flexible, and can be utilized and used with DCOM for intranet and internet applications.

Key Features of the MODBUS RTU OPC Server

- Advanced OPC data Quality and data conversion to client request
- OPC server utilizes advanced free-threading capabilities.
- Supports Multiple Groups for easy configuration and manageability
- Read/Write functionality
- Tag Multiplier let you create hundreds of tags in seconds
- GUI interface for viewing tags, groups, and real time Signals
- Full online help
- Change Device, Group and Tag properties online
- Flexible engineering units and signal ranges

Access Methods

From the Windows Start menu:

1. Select **Programs** from the Windows Start menu.
2. Select **Advantech MODBUS RTU OPC Server** from the Programs group.
3. Select the **OPCMODBUS RTU** program file from the Programs submenu.

Using the Tool's Browser

The Tree Browser displays a hierarchical list of the I/O driver and its devices, groups and tags. The I/O driver appears at the top of the tree.

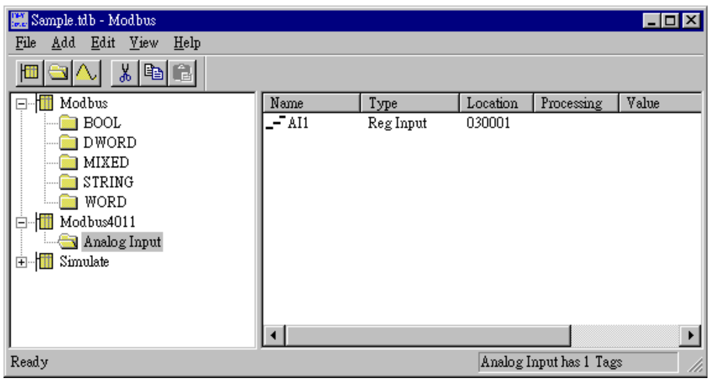


Figure D-8: Tool Tree Browser Window

When you select an item in the Tree Browser, its properties display in the *Properties Viewer*. You can choose to view the item's configuration or statistics properties by clicking buttons on the Run-time toolbar.

Changing Items in the Tree Browser

When you add or modify devices, groups or tags in the OPC Server Tool, changes are made immediately to the I/O Server. Changes you make to the driver configuration while working with the OPC Server Tool automatically display in the Tree Browser.

Refreshing the Tree Browser

To view changes made from another client application (such as another OPC Server Tool accessing the server or a custom client application accessing the server), you must refresh the Tree Browser display by selecting an item in the Tree Browser.

Collapsing and Expanding the Tree Browser

You can collapse or expand the tree under an item by double-clicking it.

Navigating the Tree Browser

Navigating through the Tree Browser can be done by selecting items with a mouse or by using the keyboard. Use the up or left arrow keys to move up in the Tree Browser. Similarly, use the down or right arrow keys to move down in the Tree Browser. You can also press a letter key to jump to the nearest item that begins with that letter.

Additional Tree Browser Features

Connection lines show the relationship between devices, groups and tags by displaying which devices are on a channel and which tags belong to a device. The plus and minus buttons indicate whether items are fully expanded or collapsed. The plus button shows that the item is collapsed and the minus buttons indicate that the item is expanded. For example, a device with a plus sign next to it means that there are groups and possibly tags configured on that device.

The Menu Bar

The Tool menu bar includes a title bar, a **Minimize** button, a **Maximize** button, a Control-menu box and the menus you can use to configure the driver. The menu bar is initially displayed at the top of the screen but you can resize it and drag it to another location.

The Tool has the following menus:

- File
- Add
- Edit
- View
- Help

You can customize the Tool's appearance by dragging the toolbars or the Tree Browser to the location you want. You can also make the toolbars or the Tree Browser float above the Tool by dragging them to the center or the screen. Later, you can dock them or resize them, as needed.

Using Shortcut Keys

The following is a list of shortcut keys for working with the I/O Driver Tool:

- **<Ctrl>-<N>:** Opens a new I/O driver configuration file.
- **<Ctrl>-<O>:** Allows you to open an existing file.
- **<Ctrl>-<S>:** Saves the current file.
- **<Ctrl>-<D>:** Add a new device
- **<Ctrl>-<G>:** Add a new group
- **<Ctrl>-<T>:** Add a new tag
- **<Ctrl>-<M>:** Add multiple new tags
- **<Ctrl>-<X>:** Cut
- **<Ctrl>-<C>:** Copy
- **<Ctrl>-<V>:** Paste
- **Del:** Delete
- **<Ctrl>-<P>:** Properties

Using the File Menu

The following commands appear on the **File** menu.

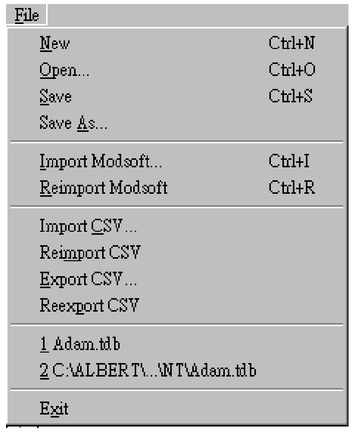


Figure D-9: File Menu Items

New
Lets you create a new server configuration file. Keyboard shortcut: <Ctrl>-<N>.

Open
Lets you open an existing server configuration file. You can select TDB file types. Keyboard shortcut: <Ctrl>-<O>.

Save
Saves the current server configuration file to the default path for configuration files with the name you specify. The default path for configuration files is the same path where you installed the server. You can change the default path by entering a new location in the *Default Path* tab of the *Tool's Setting Defaults for I/O Driver Configuration File Name and Path*.

If you save a new server configuration file, the ***Save As*** dialog box prompts you to enter a name for your server configuration file. Keyboard shortcut: <Ctrl>-<S>.

Save As
Lets you enter a new name and file type for the current server configuration.

Save As Dialog Box Options
- **Save In Field:** Lets you select the directory where you want to store the file.
- **File Name Field:** Lets you save a file with a new name, or in a different location, by entering a new file name in the File Name field or by selecting a new directory in the Save In list. To save a file with an existing file name, select the name in the list or enter the current name.
- **Save as Type Field:** Lets you specify the type of file you want to save the configuration as:

Import CSV...
Lets you import a CSV type file to be the current server configuration.

Reimport CSV...
Lets you re-import CSV type file to update the current server configuration.

Export CSV...
Lets you export current server configuration to the CSV type file.

Reexport CSV...
Lets you re-export the current server configuration to update the CSV type file.

Exit
Exits the OPC Server Tool.

Using the Add Menu

The commands that appear in the **Add** menu are for creating and modifying server configuration files. These commands correspond with the buttons on the Tool's Configuration toolbar.

Figure D-10: The Add Menu

New Device...
Let's you add a new device configuration.

New Group...
Let's you add a new group configuration to group-related tags in one device.

New Tag...
Let's you add a new tag configuration in one device.

Multiply...
The tag Multiplier provides an easy and fast method for creating many tags without having to individually enter all of them.

Using the Edit Menu

The commands that appear in the **Edit** menu are for cutting, copying, pasting, deleting and modifying configuration data. You also can configure the COM port in this menu.

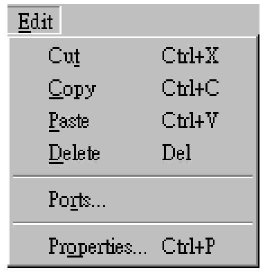


Figure D-11: The Edit Menu

Cut
Let's you cut the selected tag.

Copy
Let's you copy the selected tag.

Paste
Let's you paste cut tags to the device.

Delete
Let's you delete the selected tag.

Ports...
Let's you define the configuration of the selected COM port.

Properties...
Let's you define the configuration of selected devices, groups and tags.

Using the Help Menu

The commands that appear in the **Help** menu are for displaying the MODBUS RTU OPC Server online help and version number.

Figure D-12: The Help Menu

About MODBUS RTU...

Displays related information of MODBUS RTU modules.

Help Contents

Displays online help information of MODBUS RTU OPC Server.

Configuring the I/O Driver with the Tool

To configure the MODBUS RTU OPC Server with the tool:

1. Click the **New** button in the **File** menu to create a new configuration file.
2. Click the **New Device** button in the **Add** menu to add a new device to the Tree Browser.
3. Click the **New Group** button in the **Add** menu to add a new group for selected device.
4. Click the **New Tag** button in the **Add** menu to add a new tag for selected group.
5. Modify the fields in the *Properties Viewer* as needed.

To modify the fields in the *Properties Viewer*:

1. Select a device, group or tag from the Tree Browser and click the **Properties** button in the **Edit** menu. The fields for the selected item appear in the *Properties Viewer*.
2. Edit the fields you want to change.

Adding and Modifying Devices

To add a new device to your server configuration:

1. Click the **Add Device** button on the **Add** menu of the *Configuration* toolbar. The new device appears in the Tree Browser and the fields for entering device properties appear in the *Device Properties* dialog.
2. Enter the properties for the new device. Edits to a field do not take effect until you remove the focus (or cursor) from the field and click the **OK** button.

To modify an existing device:

1. Select the device you want to modify from the Tree Browser.
2. Select the specified device and click on the **Properties** button in the **Edit** menu bar. The *Device Properties* dialog will be displayed for device modification.
3. Edit the device's fields as needed.

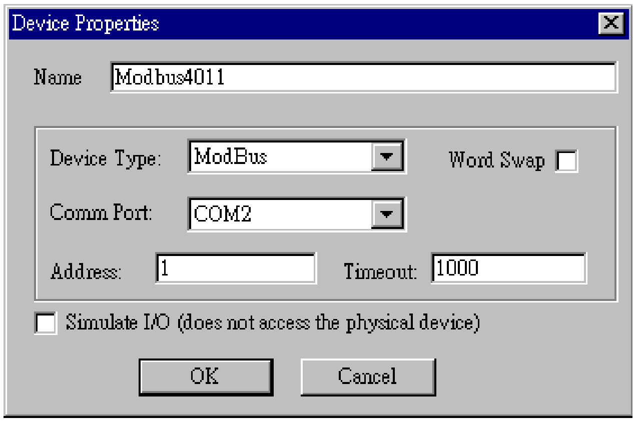


Figure D-13: Device Properties Configuration Window

Device Name

Specifies the name of the added or modified device.

- **Valid Entries**: Up to 12 alphanumeric characters

Device Type

Specifies the hardware type of the selected device. This property is used to indicate which kind of device used. For this ModBUS RTU OPC Server, the default value is "ModBus".

COMM Port

Specifies which physical COM port to use for the selected channel. You can specify as many channels as necessary for communication with your hardware.

- Valid Entries: COM1 to COM2 (if available) computer ports
- COM3 to COM8: Expansion Ports
- Any valid COM port name: Expansion Ports

IMPORTANT Verify that the COM port you select is not used by another channel or application. Assigning two channels to the same port results in a communication failure on one of the channels. Assigning a channel to a COM port used by another application (such as an alarm printer) can produce problems with driver communication.

Timeout

Specifies how long the I/O driver waits for a response from the selected device. The base of the timeout field is mini second. For example, if you specify 1000 in this field, the server will wait for a response about 1000 milliseconds (equal to 1 second).

- Valid Entries: *1 ~ 65535*

Address

Specifies the address number of the selected device in RS-485 communication line.

- Valid Entries: 0 to 255, and NONE

Simulation I/O

Specifies the device to be a virtual device. It does not connect to any physical devices. But it would provide a simulation signal to the server.

- Valid Entries: Enabled and Disabled

To delete an existing device

1. Select the device you want to delete from the Tree Browser.
2. Click on the *Delete* button in the *Edit* menu bar.

Adding and Modifying Tag Groups

To add a new group into the selected device:

1. Select the device to which you want to add a tag group from the Tree Browser.
2. Click the **New Group** button on the **Add** menu of the *Configuration* toolbar. The new group appears in the Tree Browser and the fields for entering group properties appear in the *Group Properties* dialog.
3. Enter the group name for the new tag group. Edits to a field do not take effect until you remove the focus (or cursor) from the field and press the **OK** button.

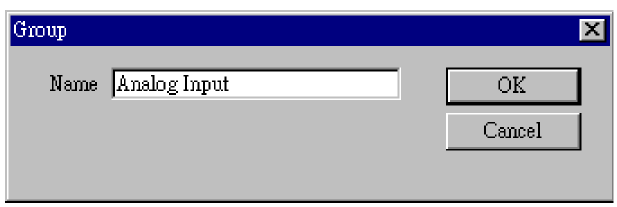


Figure D-14: Group Configuration Dialog Box

To modify an existing group:

1. Select the group you want to modify from the Tree Browser.
2. Select the **Properties** button from the **Edit** menu bar. The *Group* properties dialog will pop up for modification.

To delete an existing group:

1. Select the group you want to delete from the Tree Browser.
2. Click on the **Delete** button in the **Edit** menu bar.

Adding and Modifying Tags

To add a new tag to the selected device:

1. Select the group and device to which you want to add a tag from the Tree Browser.
2. Click the **New Tag** button on the **Add** menu of the *Configuration* toolbar. The new tag appears in the workspace at the left of the window. The fields for entering tag properties appear in the *Tag Properties* dialog.
3. Enter the tag name for the new tag. Edits to a field do not take effect until you remove the focus (or cursor) from the field and press **OK** button.

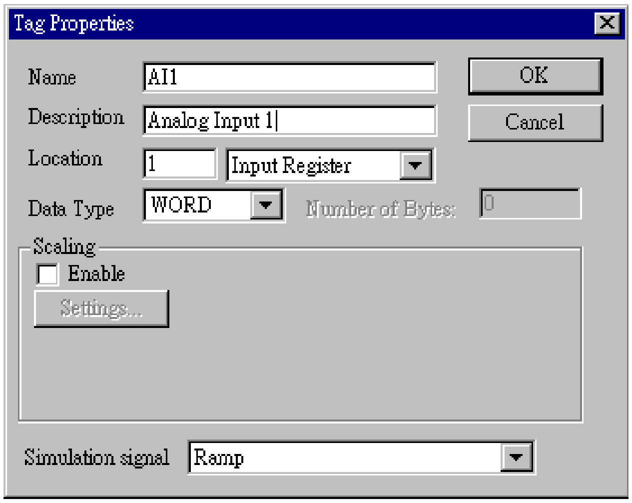


Figure D-15: Tag Properties Configuration Dialog Box

To modify an existing tag:

1. Select the tag you want to modify from the Tree Browser.
2. Click on the **Properties** button in the *Edit* menu bar. The *Tag Properties* dialog will be displayed for tag modification.
3. Edit the tag's fields as needed.

Tag Name

Specifies the name of the added or modified I/O tag.

- Valid Entries: Up to 12 alphanumeric characters

Tag Description

Contains text about the selected tag. Entries in this field can be very helpful when you look for the connection of I/O tag and physical I/O points. The more detailed and specific the information you enter in this field, the easier it will be to identify the I/O at a later date.

- Valid Entries: Up to 40 alphanumeric characters and symbols.

Location

This property indicates the register address that the tag represents. The location is comprised of two parts. One is the offset address and the other one is the base address. The first part of the *Location* field is the offset value. You can input the decimal value for it, for example 1. The second part of the *Location* field is the type of I/O tag. Each type of I/O tag is featured with different base address for the register. The base address for each I/O tag is listed as below:

Type of I/O Tags	Base Address
Input Coil	000000
Output Coil	010000
Input Register	030000
Output Register	040000

Figure D-16: Type of I/O Tags and Base Address

For example, if you define the I/O tag to be "Output Coil" and its location is 6, the location address of this I/O tag would be 010006. (You can find this location address at Tag Browser area).

Data Type

Specifies the tag's default data type. The driver uses this data type for the tag if you do not specify a database block hardware option.

Valid Entries

Data Type	Description
INT	Signed 16-bit integer.
LONG	Signed 32-bit integer.
FLOAT	32-bit float point (IEEE)
STRING	ASCII character set.
BIT	An individual bit from a register
WORD	Unsigned 32-bit integer.

Figure D-17: Data Types and Their Description

Scaling & Simulation

This group is used for I/O simulation. It will generate I/O signals automatically without connecting hardware. If you define the device to be a simulation I/O, the tag belonging to the device that would be defined as a simulation signal.

- **Enabled:** The range of input values from the simulation signal would be re-scaled to be the setting range. The **Setting** button will be active while this field is enabled. Click on the **Setting** button and a *Tag Process Setting* dialog will be displayed for input scaling values. You can select the conversion type to be *Linear* or *Square Root*.

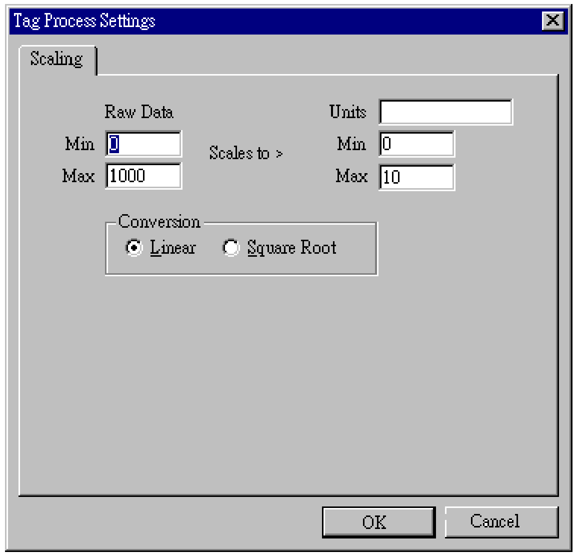


Figure D-18: Tag Process Settings

- **Simulation Type**: There are three simulation signals offered. These simulation signals are *Sine*, *Ramp*, and *Random.*

Configuring the I/O Driver for Window CE

MODBUS RTU OPC Server Windows CE version is an in-process server. If you use MODBUS RTU OPC server Windows CE version, you should first create and configure this server in the Windows NT environment. After configuration, download MODBUS RTU OPC Server Window CE DLL file and the configuration file (TDB file) to the Windows CE target platform.

Note: *The file name for MODBUS RTU OPC Server configuration file at Windows CE device must be "MODBOPC.TDB".*

Using OPC Client

An OPC Client application, provided with the MODBUS RTU OPC Server, has multiple methods for quickly connecting to your servers. The OPC Client is able to browse the registry of a PC and display a complete list of all installed OPC Servers. It also provides real-time live data feedback and OPC Server browsing capabilities.

The OPC Client is also helpful for connecting and testing other 3rd party OPC applications connected to same server.

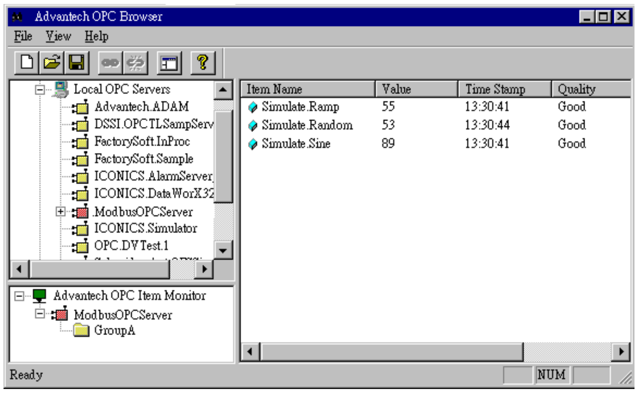


Figure D-19: OPC Client Browser Window

Features

- Setup dialog box for defining the default name and default setting for configuration files.
- Tree Browser for an overall view of your system setup.
- Moveable Tree Browser and toolbars.

Connecting OPC Server

When OPC servers are installed on the system, they are registered so that clients can find them and users can view them in a list. To make a client/server connection, the user must first choose a server. The server name selected (for example, Advantech.Modbus) is used to get a class ID which, in turn, is used to create a COM object. If the user selects a server that is not currently running, the system starts the server and then creates the object in that server on behalf of the client.

Once the COM object is created, the client application has an IOPCServer interface, as defined in the OPC specification. This is the main interface to the OPC server and this document refers to this as a Server interface. The other interface is Group. This OPC client always creates a group and registers an device interface with it to get asynchronous data notification.

When an item is added, the dialog displays either a hierarchy or a flat list of names, depending on the server. The names are queried from the Server object using the filter string and requested data type. When the user either types or selects a name, an item by that name is added to the Group object. This item is also read immediately to get an initial value.

Items in a group are scanned by the server; when their values change, the device interface in the client is notified. A data structure containing the data for each item whose value or quality has changed (and only those items) is passed to the client deviee interface. The client unpacks and uses the data.

Server Status and Group Parameters

The *Server Status* dialog periodically queries the Server object for the status and displays the results. The *Group Parameters* dialog box queries the group state and displays the results. The **OK** or **Apply** buttons in the *Group Parameters* dialog box write the parameters from the dialog to the Group object and read the parameters back. This primarily controls the scanning and updating of data. When a group is inactive, it does not send data notifications to the client and typically there is no reason to scan the items when the group is inactive. The *Update Rate* in the *Group Parameters* dialog box specifies the rate at which data notifications should be sent back to the client, assuming that data has changed. This is also the rate at which items are scanned on behalf of this client.

To write a value to an item, select the item in the *OPC Client* windows and choose **Write Value to Item** from the **OPC** menu. The client writes the value typed in the *Write Item Value* dialog box to the correct item in the *Group* object. The method of writing data is determined by the synchronous check-box. When data is written synchronously, the call to the server is blocked until the operation has completed, which may take a long time. When data is written asynchronously, the call to the server returns quickly and the operation is carried out on another thread. When writing has finished, the client device interface is notified of the results.

The user can disconnect from the selected server by choosing **Disconnect** from the **OPC** menu, The **Disconnect** command unregisters the device interface, releases the *Group* object, and then releases the *Server* object. Releasing an object means that the client is no longer interested in the object, so the system can delete the object in the server.

Configuring the OPC Client

The OPC Client is used as a test case to debug an OPC Compliant Server and access some of the OPC variables and parameter configuration.

1. Start the OPC Client by clicking its shortcut icon.

Figure D-20: Advantech OPC Client Icon

2. Select the Advantech OPC Items Monitor on the bottom-left of the OPC Browser and right-click the mouse. You can add and connect the OPC Server to this browser.

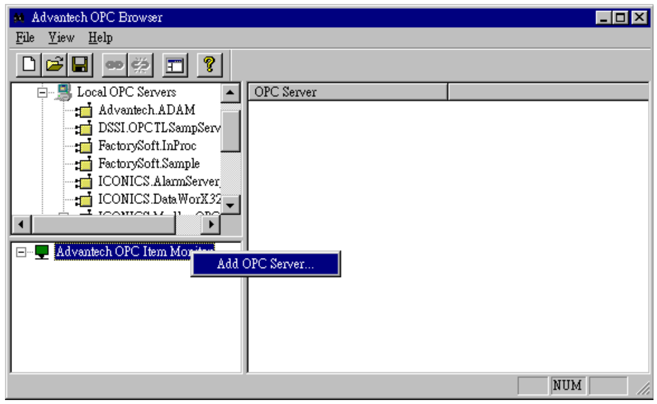


Figure D-21: OPC Server Browser Window

3. Select *Advantech MODBUS RTU OPC* and click **OK**. This connects the OPC Client to the MODBUS RTU OPC server.

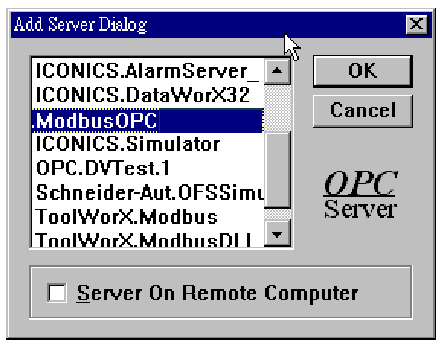


Figure D-22: Add Server Dialog Box

4. Select *Advantech ModBUS RTU OPC* server and right-click the mouse. You can add a *Group* for the connected OPC Server to the OPC Client. The *Add Group* dialog box appears, as shown below:

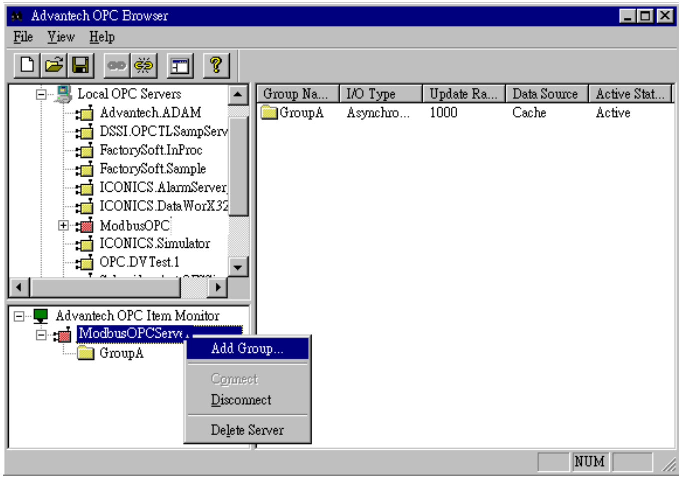


Figure D-23: Adding a Group in the Advantech OPC Browser Window

5. After adding a group, you can add items for each OPC group. Select a dedicated OPC group and right-click the mouse. You can add an *Item* for the connected OPC Server to the OPC Client. *The Add Item* dialog box appears, as shown below:

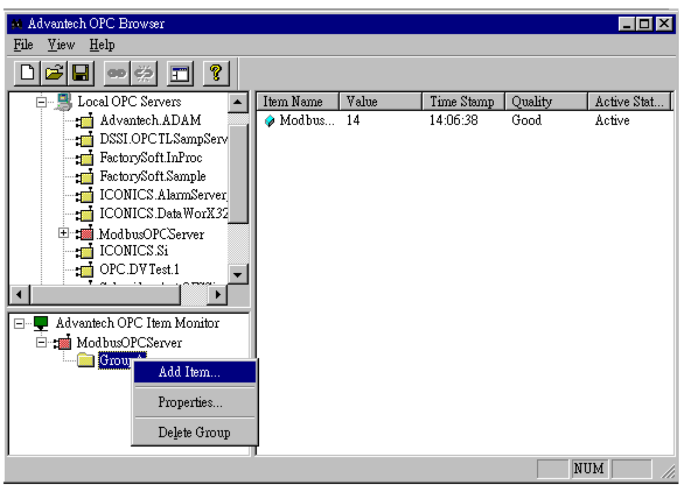


Figure D-24: Adding an Item in the Advantech OPC Browser Window

6. The *Add Item* dialog box displays the devices, groups, and tags defined in the current server configuration. You can select an item name of the connected OPC server and the OPC client’s *Item ID* will be generated automatically.

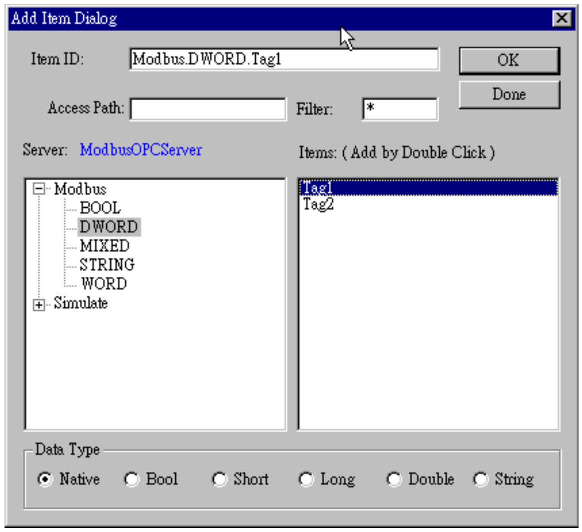


Figure D-25: Add Item Dialog Box

In the *Browse Items* list, select the device, group, and tag. The full name appears in the *Item Name* field. For example, "Modbus.DWORD.Tag1".

To add more tags, just repeat previous steps.

Accessing the OPC Server

After connecting the OPC server and configuring the linkage, OPC server data will be displayed in the *Item* window (on the right side of the OPC client window) immediately. The OPC server data value is automatically updated at OPC client *Item* window. Beside that, you also can read or write data value to OPC server manually.

The steps to read or write data values manually to an OPC server are:

1. Select the specific OPC item.
2. Click the right button of the mouse to invoke OPC item's function menu.
3. Select **Read/Write** menu option.

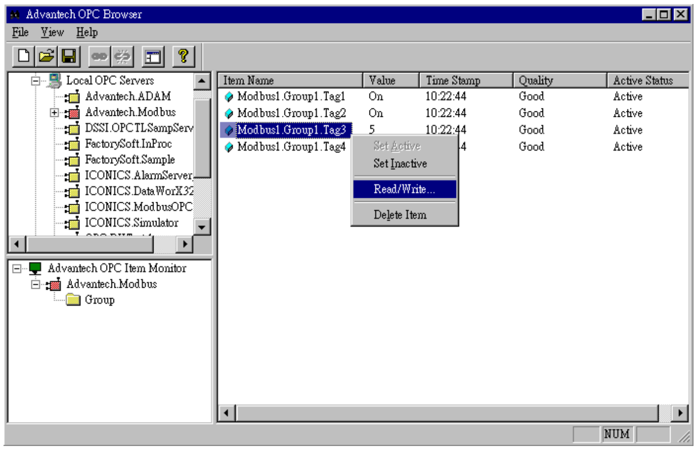


Figure D-26: Selecting Read/Write from the OPC Browser Window

4. Click the **Read** button within the **Read/Write Item Value Dialog** window. You will get the current value of the specific OPC item in the next field.

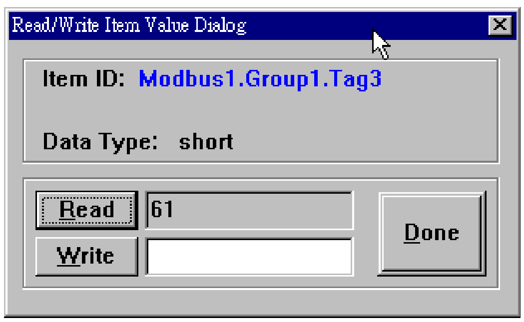


Figure D-27: Read/Write Item Value Dialog Window

5. If you want to write data values to a specific OPC item, key in the output value in the blank field near the **Write** button and press the **Write** button. This output value will be output to the OPC server directly.

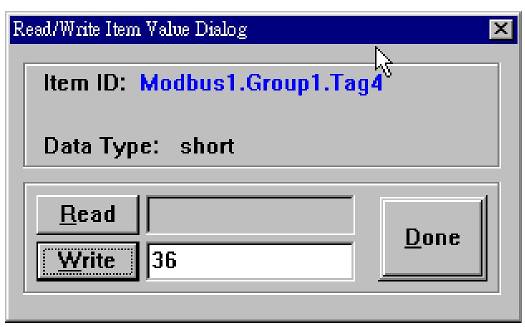


Figure D-28: Read/Write Item Value Dialog Window

6. If you want to exit the “Read/Write” operation, press the **Done** button and you will be returned back to *OPC Client* window.

Summary

The Advantech Modbus RTU OPC Server facilitates communication with OPC clients and control devices. It supports a popular Modbus protocol and can be connected to real world Modbus compatible I/O hardware.

The MODBUS RTU OPC Server tool is your main configuration utility for setting up and maintaining the MODBUS RTU I/O driver. It provides fields for specifying the properties of devices, groups and tags.

An OPC Client application, provided with the MODBUS RTU OPC Server, has multiple methods for quickly connecting to your servers. The OPC Client is able to browse the registry of a PC and display a complete list of all installed OPC Servers. It also provides real-time live data feedback and OPC Server browsing capabilities. There is a Setup dialog box for defining the default name and default setting for configuration files, a Tree Browser for an overall view of your system setup and a Moveable Tree Browser and toolbars.