DARWIN SERIES PC SOFTWARE DAQ32 PLUS

KOBUCHI Keiichiro [1]   NAGUMO Yasushi [1]   TANIZUME Yasuhiro [1]   MURATA Hironori [1]

The DAQ32 Plus, a PC software package for the DARWIN family has been developed to cover all data acquisition processes from system configuration to data processing. It supports the entire DARWIN series and consists of a DARWIN hardware configurator, Logger, and Historical Viewer. This paper describes the structure of this software.

INTRODUCTION

Yokogawa has set a new standard in data acquisition by rolling out the DARWIN series in 1995. The concept behind DARWIN is to offer features that are normally conflicting such as data acquisition that is easy-to-use yet highly expandable, by combining a data acquisition engine, a measuring unit with display and output mechanisms. The release of the DR series hybrid recorders, DA100 data acquisition unit, and DC100 data collector all helped achieve this aim.

Recently, as the use of personal computers has spread, more and more importance has been put on the connectivity of data acquisition equipment to a personal computer. As the interface for a personal computer, it has become increasingly necessary for the PC software to provide an easy-to-use human interface in addition to a number of other functions including the configuration of data acquisition equipment, loading of equipment settings via communication or via a removable storage medium, setting of data acquisition conditions, communication retry in case of a communication failure, recovery of data acquisition by communication retry, automatic division of data acquisition files into multiple files, display of acquired data in diversified formats, a DDE server function, password protection, retrieval and analyses of data from files containing data acquired in the past, conversion of acquired data, calibration of each measurement channel of equipment, and diagnosis of equipment status.

To meet these requirements we developed DAQ32 Plus, a PC software package that supports the DARWIN series. Figure 1 shows the monitoring windows of DAQ32 Plus on a PC screen.

*1 Test and Measurement Business Division

FEATURES

(1) Durable against hang-ups
   Since the interface for user input is separated from the data acquisition and filing processes, the data acquisition is rarely affected when the user interface is hung.

(2) Consistent display image
   DAQ32 Plus consists of multiple applications. By using both an original graphic class library (GCL) and the Microsoft Foundation Class (MFC; a C++ class library supplied by Microsoft for the development of Windows applications), a number of original graphic objects can be run under the Windows operating system while providing constant images of all the bundled applications.

(3) Compatible with all communication modules of the DARWIN series
   The communication devices offered by the extensive DARWIN series lineup include the RS-232-C, RS-422/485, GP-IB, and Ethernet modules. DAQ32 Plus can support all of these communication modules using multiple dynamic link libraries (DLLs) to perform exchanges with the physical parts of communication modules.

(4) Almost no data loss
   Since DAQ32 Plus uses the first-in first-out buffer in each DARWIN series unit, it hardly ever fails to acquire data even when the performance of the PC is lowered by the operation of other applications. This assures the most flawless data acquisition possible.

(5) Program linkage
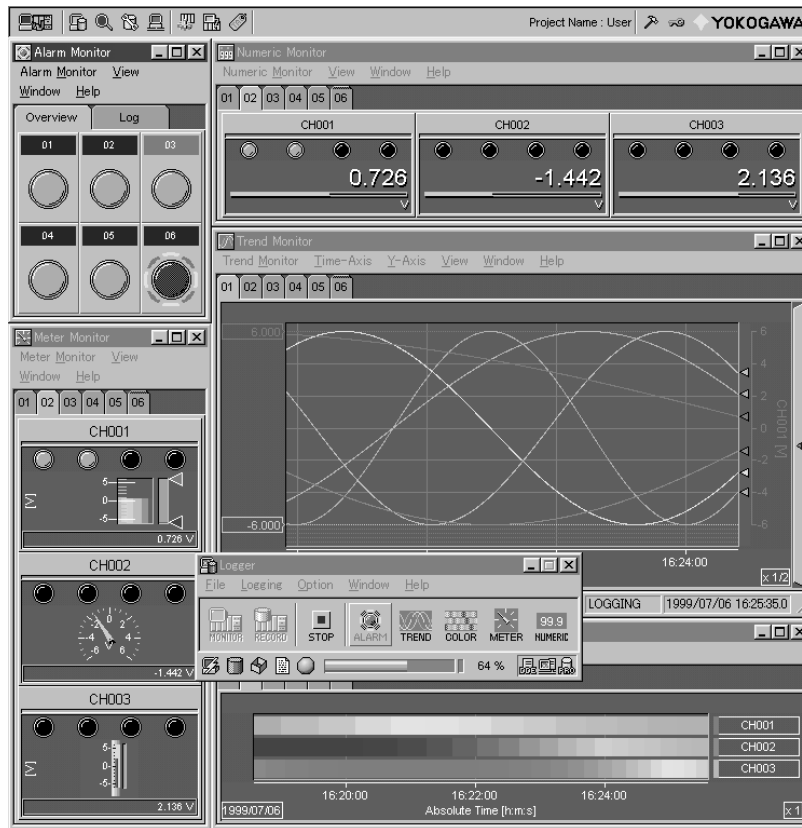   Programs are linked to one another to enable display settings

Figure 1 Monitoring Windows of DAQ32 Plus

to be shared between monitoring windows, the monitoring windows to be sorted, a one-touch redisplay of the current data acquisition file in the viewer application, an exclusion process between programs, and more.

(6) Compatible with Windows 95, Windows 98, and Windows NT 4.0

Even though Windows 95, Windows 98, and Windows NT 4.0 differ from each other in various aspects, DAQ32 Plus operation remains unchanged.

SOFTWARE CONFIGURATION

DAQ32 Plus is composed of the following software applications:

- Launcher

The launcher display buttons are shown in the top left window in Figure 1. The launcher allows the user to run other software applications while performing communication with the DARWIN unit, creating data files and setting files, and conducting exclusion processes between programs.

- Logger

All windows below the launcher buttons in Figure 1 are monitoring windows of the Logger, which provides the human interface for data logging and has various monitoring windows. As shown in Figure 1, the user can use these

monitoring windows to configure the screen as desired. The Logger is also provided with the DDE server function, so a DDE server can be used to directly transfer data to Excel and other DDE-compatible applications at the same time as data acquisition is being carried out.

- DARWIN Hardware Configurator (Figure 2)
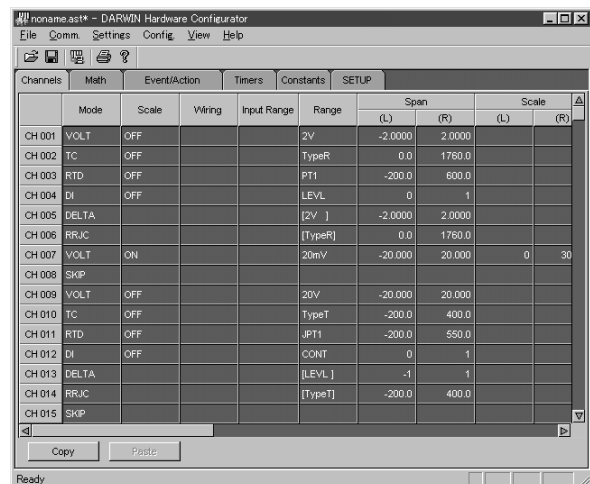
All configuration settings of DARWIN hardware can be

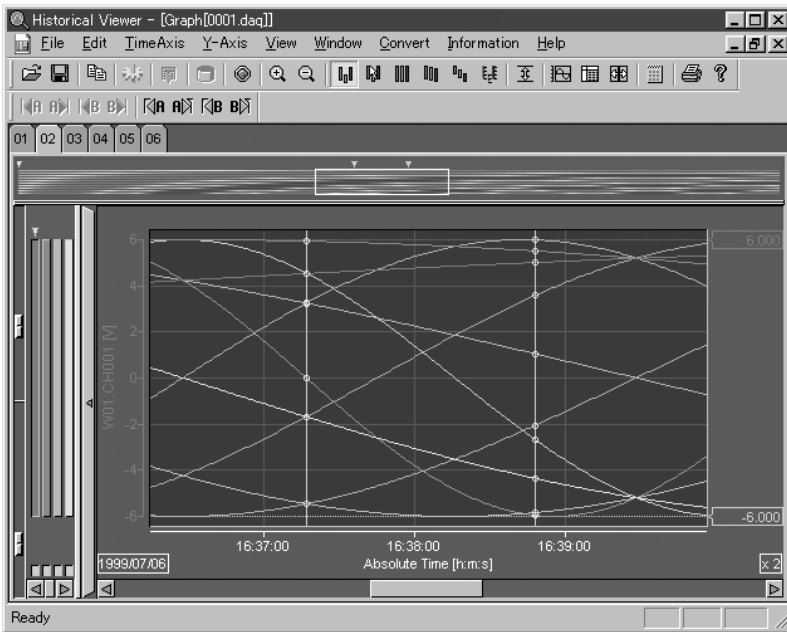**Figure 2** DARWIN Hardware Configurator

Figure 3 Historical Viewer

Viewer, as trend graphs and numerical value tables. The Historical Viewer also has data processing functions such as file format conversion, computations for data between specified times, and printing.

• Software Configurator (Figure 4)
Software Configurator consists of system setup, diagnosis, and calibration software that allow the user to (1) make the settings of DAQ32 Plus such as those for communication with DARWIN hardware; (2) monitor the status of the DARWIN hardware connected; and (3) calibrate the DARWIN hardware.

• Tag Editor (Figure 5)
Tag Editor is used to set the tags and tag ID characters used by DAQ32 Plus. The tag and tag ID settings can be downloaded to and uploaded from a DR series recorder and a DC100 via general-purpose communication.

modified in spreadsheet format. Consequently, the modified configuration settings can be uploaded from and downloaded to the DARWIN hardware via communication or a floppy disk. This DARWIN Hardware Configurator supports DR series recorders, DA100, and DC100 despite differences in their functions.

• Historical Viewer (Figure 3)
Data files corrected periodically by the Logger, a DR series recorder, a DA100, or a DC100, or data files corrected at specific times by a DC100 are displayed by the Historical

PACKAGE STRUCTURE

As previously mentioned, DAQ32 Plus is composed of multiple software applications that are linked to each other. Messages are used to activate linkages and shared memory is used to supply data between applications. This structure is designed to enable interlocks between software applications and to secure the integrity of the entire package.

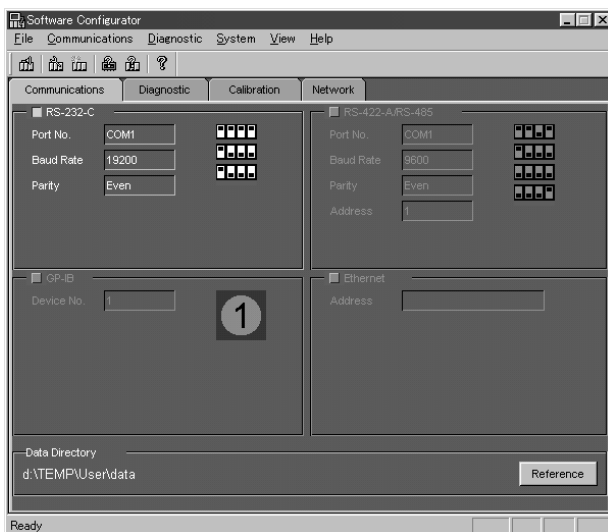Each application runs processes individually, so an application going down does not cause the entire package to go
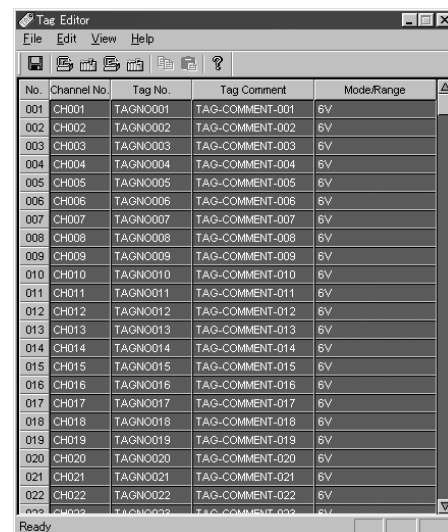

Figure 4 Software Configurator

Figure 5 Tag Editor

down. The advantages of this feature are great, especially with regards to the security of data acquisition. Since the human interface, data acquisition and storage can be configured in separate processes, data acquisition is not affected in the event that the human interface becomes inoperable because of an operation mistake.

For example, even if a failure in the user program causes the DDE server to shut down, data acquisition is not affected when a user application and DAQ32 Plus are running simultaneously and data exchange is taking place between them via the DDE server provided in DAQ32 Plus.

SOFTWARE STRUCTURE

There are two significant features in the structure of each software application: the first being the fact that the original GCL is combined with the MFC, and the second being the variety of DLLs called from each software application.

As seen from Figures 1-5, the windows of the applications bundled in DAQ32 Plus have a consistent image. This consistent window design has been achieved by the original GCL. The GCL supports actions in the client area of each application window (the client area stands for the area inside each window except for the menu bar, toolbar(s), and status bar). It does this by receiving from the system the details of any user input entered into the client area using the mouse and performing various actions in response to that input. The GCL is composed of various display objects. As a class library, users are allowed to create their own graphic objects and assemble objects. This has not only improved development efficiency results by reusing parts, but also enables the drawing of various display objects that could previously only be drawn with the MFC.

DAQ32 Plus is run on many DLLs. Fundamentally, each software application performs processes for the human interface, while DLLs perform background processes for communication and input/output files of diverse formats. A merit of dividing functional assignments is the efficiency of the development process as a result of different persons developing each part independently. Furthermore, DLLs are designed hierarchically and all applications interface with the same DLL, meaning that software can be developed at a higher level without considering the data types.

For example, although DAQ32 Plus supports multiple communication devices, each of its applications were developed regardless of differences between devices. Another example is the fact that software at a higher level was built without considering the differences between the various types of data files or data formats that DAQ32 Plus handles. This structural feature not only improves development efficiency but also improves the overall software quality, because it is no longer necessary for higher-level software to be modified when new data formats or communication devices are added; it is sufficient to just modify or add DLLs.

HUMAN INTERFACE

When we developed DAQ32 Plus, our aim was to create an easy-to-use human interface offering excellent operability for worldwide markets.

Before developing this product, we undertook thorough research in the US market where almost all globally successful human-interface software applications are born, to establish exactly what was required of DAQ32 Plus's human interface. Many aspects of these findings have been incorporated into DAQ32 Plus. The research revealed the merit of structurally separating the human interface from other parts, as although some parts of the package required change, the overall package configurations did not.

CONCLUSION

This paper describes the features, software configuration, package structure, software structure, and human interface structure of DAQ32 Plus. DAQ32 Plus is a PC software package that allows the user to configure a data acquisition system that makes full use of a DARWIN series unit and satisfies user needs with extensive functions, operational integrity and a superb human interface. We hope that users of DARWIN all take the opportunity to experience the excellence of DAQ32 Plus. ◆

REFERENCES

(1) Sato T., Takahashi M., "DARWIN Series Data Acquisition Units," Yokogawa Technical Report, Vol. 40, No. 3, pp. 95-98, 1996, in Japanese
(2) Kuribayashi H., Nakayama A., Nagumo Y., "DC100 DARWIN Series Data Collector," Yokogawa Technical Report, Vol. 42, No. 3, pp. 119-122, 1998, in Japanese