



## Proficiency RX™

### Process Analysis Software for Process Analytical Technologies (PAT)

Process understanding lies at the heart of any PAT deployment. Multiple types of instruments, hardware and software are an obstacle to collecting, consolidating and analyzing data. Challenges exist with varied data types, non-intuitive software environments and validation of disparate applications. Proficiency RX from GE Fanuc helps you address those challenges and drive manufacturing operational improvement.

#### Addressing Production Challenges

Proficiency RX is a unique software solution that provides standardized control and networking of multiple instruments, eliminating the necessity to manage, learn and validate multiple instrument interface software applications. Preprocessing of analytical data ensures similar data formats and protocols and the intuitive nature of Proficiency RX provides a single development environment, and 21 CFR Part 11 tools ensure quick and compliant deployment in regulated environments.

#### Managing the Measurement Process

Proficiency RX manages the measurement process – from application development to routine on-line operation. During development it provides all of the tools needed to design virtually any analytical method. Once a method has been developed, it can be locked down and provided with a custom operator screen with access to predetermined set of operations and displays.

In the traditional world of distributed control Systems (DCS) and programmable logic controllers (PLC), relatively simple sensors such as RTDs, flow meters, and pressure gauges are used to provide one dimensional (scalar) information which can be processed directly by the DCS/PLC. With advent of Process Analytical Technology,

the situation has changed drastically. An analytical instrument, such as a near-infrared (NIR) spectrometer, may provide as many as 2,000 independent spectral data points in less than a second. This large amount of data must be collected, stored, displayed, transmitted, and processed in such a way as to provide timely and manageable information about the process variables of interest. Proficiency RX fills this role, bridging the gap between the instrumentation at the manufacturing process and the data historian, SCADA, or other enterprise-level data system.

#### Key Elements of the Proficiency RX Approach

Proficiency RX is organized in such a way as to provide a high degree of flexibility within a framework specifically tailored to the needs of analytical instrumentation.

#### Database Storage

Proficiency RX employs a standard database structure for all user information, and configuration protocols. This structure provides a full audit trail while facilitating networking and hand-off to other data systems.

#### Proficiency Historian Data Storage

Proficiency RX leverages the power of Proficiency Historian for storage of all spectral data. Proficiency Historian provides an efficient and secure means of storage, allowing for a single, true, “system of record” for all manufacturing data.

#### PAT-Specific User Interface

Proficiency RX's four main windows are designed to streamline the performance of the tasks typically encountered in process analysis.

#### PAT-Specific Command Structure

Proficiency RX's command syntax is modular and hierarchical. As a result, it requires only a relatively small number of easily understood standardized commands to meet the great majority of both laboratory and process requirements.

#### Standardized Instrument and Software Interfacing

The unique requirements of individual instruments, sampling systems, chemometrics routines, and enterprise-wide data systems are met by specific Proficiency RX drivers.

#### Menu-Driven Method Development

Proficiency RX's composer utility includes pop-up script composers for all of the standard commands. These enable you to design any analytical method by simply selecting items from pull-down menus and filling in blanks.

### Proficiency RX's Major Functions:

- Sample system design and control
- Simultaneous control of multiple analyzers
- Real-time trending of any number of streams
- System diagnostics, data display, and alarming
- Archiving of data in a local or remote SQL database
- Comprehensive historical data analysis



## Proficy RX's Four Main Windows in Brief:

Proficy RX's diverse capabilities are grouped into four categories corresponding to the program's four main windows. Access to these windows and to many of their specific functions is controlled by user privileges set by the system administrator. The four windows can be displayed individually or in any combination. (See Figure 1.) Their primary functions are as follows:

### The Manual Window:

Allows you to operate an instrument in real time and to perform various operations on the data obtained. Simply select the instrument of choice and operating parameters from the pull-down menu and start collecting data.

### The Set-Up Window:

Includes the script composer, user and database management utilities, system preferences functions, and other utilities to enable you to configure an analysis method to meet virtually any need.

### The Run-Time Window:

Displays the information required to monitor a process in real time. In its most general form it includes multiple trend plots, displays of current and recent spectra, and tabular statistical information. It can easily be customized to provide only the specific displays required for a particular application.

### The Historical Window:

Provides access to all of the data stored in the database. Data can be searched by any combination of attributes such as time and date, series, name, instrument, operator, process line, etc.

## Unique Characteristics

### A Clean Slate

Proficy RX has been developed from the start to meet a set of specific requirements established by members of the process analytical community. It is organized from the top down using state of the art software tools. As a result, it provides both ease of use and broad capability combined with freedom from legacy code and obsolete methodologies.

### Extensible yet Secure:

The Proficy RX scripting language allows the developer to design virtually any analytical configuration by means of a finite set of standard hierarchical commands. Extensibility is provided by the use of modular arguments referring to specific drivers which provide access to diverse instruments and third party software programs. At the same time, safeguards have been built in to prevent the user from altering the Proficy RX code in any way. The commands and data are secure and fully traceable. In addition, the RX version includes safeguards which make it impossible to delete or alter a method or configuration once it has been designed. This capability ensures rapid deployment in a regulated environment.

### Seamless Linking to Third-Party Programs

Proficy RX enables you to link to a variety of other programs and call the commands of many of these programs from within the Proficy RX command structure. This enables you to call up existing chemometric calibrations developed using programs such as MatLab, Pirouette, Simca, and PLSplus/IQ and embed them within Proficy RX commands. The ability to interface to 3rd party Multivariate Analysis (MVA) applications allows for Proficy RX to be deployed in existing applications already using MVA software or as a component in a comprehensive PAT deployment.

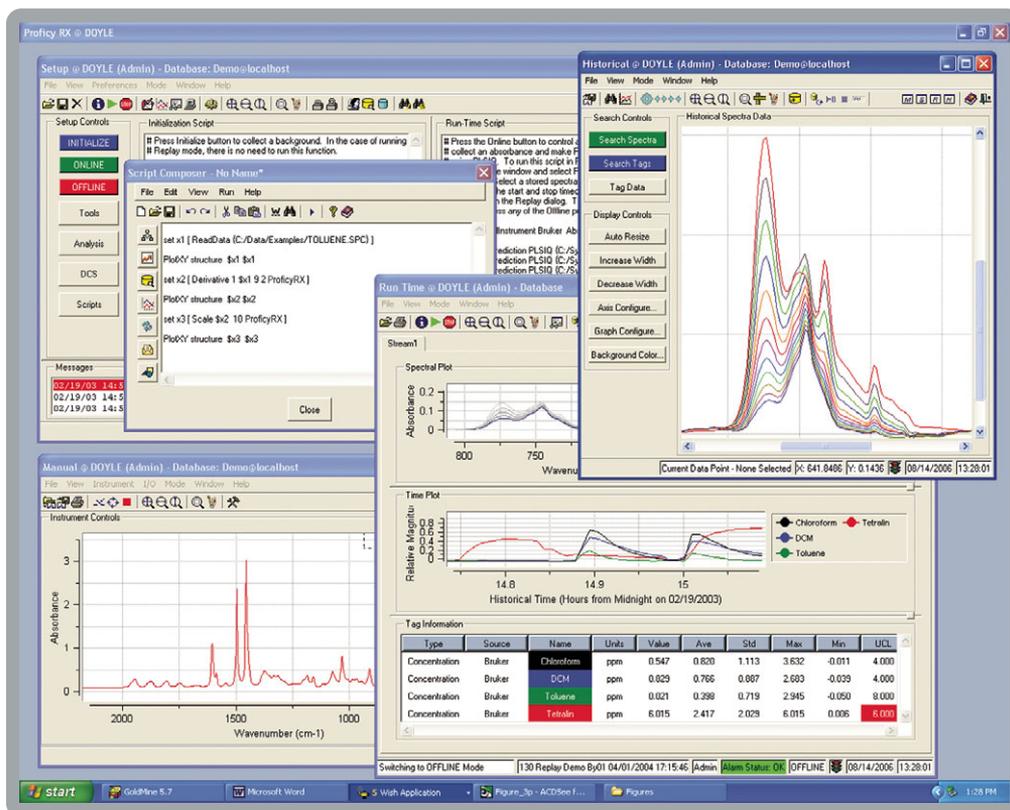


Figure 1: Simultaneous display of Proficy RX's four primary windows.

## Rapid Methods Development

The Proficy RX "Scripting Assistants" enable you to automatically write a script by means of a series of pop-up windows and pull-down menus corresponding to all of the standard Proficy RX operational commands as well as a range of mathematical capabilities. The standard commands enable you to link to and control diverse instruments, I/O devices, and third party programs and to configure the sequencing of their operation to provide a complete operating method or configuration. Once developed, the measurement configuration can be stored under an assigned name and be given revision ID for future use.

## Security Guard™ Architecture:

Proficy RX's unique architecture insures automatic tracking of all operations and provides both the tools and the security required to comply with 21 CFR Part 11.

## Modes of Operation

### Manual Window

The manual window (Figure 2) allows the user to operate the analyzer and the various elements of a sampling system in real time. This mode is for off-line system and data trouble-shooting. It allows for set up of instrument operating parameters, control of the instrument and sampling system, saving and recalling spectra, and performing various operations on these spectra. Various capabilities of the window are controlled from a set of pull-down menus at the top of the screen, as shown in Figure 2. The current status of the instrument is indicated by messages at the bottom of the screen. Operations can be performed on an individual spectrum by right clicking on its tag to the right of the spectral display and making appropriate selections from the associated pull-down menus.

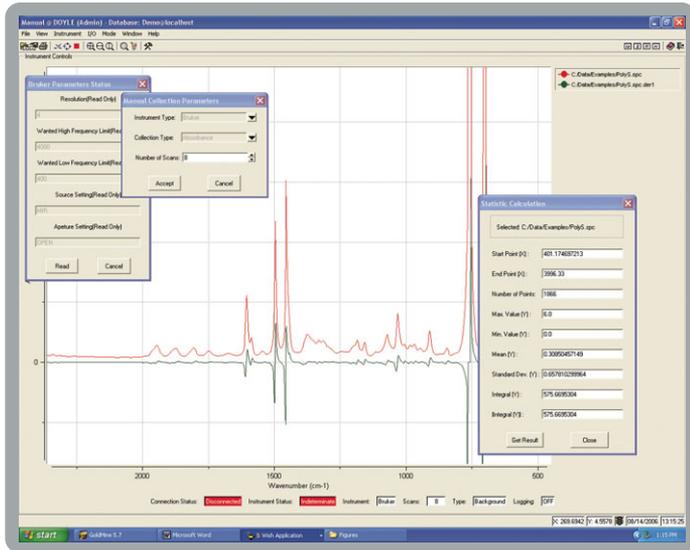


Figure 2  
The Manual operation window showing typical menus and information displays.

## Setup Window

This window provides the tools needed for the System Administrator or Developer to configure Proficy RX to meet specific needs and to build and test analysis configurations and routines prior to on-line deployment. Figure 3 illustrates some of the features of the Setup program. The script being used to initialize the system and control run time operation is displayed in the two main text areas. New analysis routines can be written and tested without affecting concurrent on-line operation. This allows for writing commands for most operations without needing to know the syntax of the Proficy RX language and for rapid deployment of analysis routines.

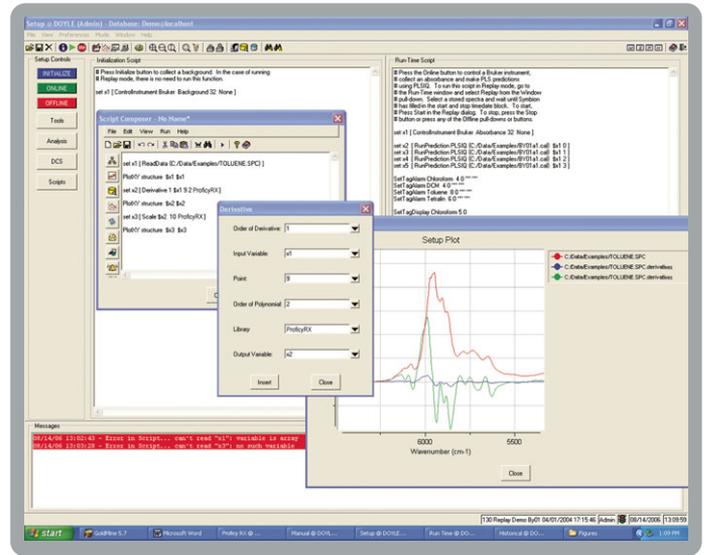


Figure 3  
Set-up window showing script composer, scripting assistant pop-up, and resulting spectral display.

## Run-time Window

The run-time window provides the real-time display, SPC trend plots, statistical information, alarms, and other time-dependent functions required during on-line operation. "Replay Mode" also allows historical data to be replayed as a function of time using either the current or a new calibration. This capability is extremely useful during method development. Replay Mode allows the user to analyze the effect of the calibration and to make improvements to the calibration while watching the actual data. The standard run-time window (Figure 4) includes three display areas. The upper area displays the most recent spectrum (or other data) acquired or replayed from memory. The middle area displays the current trend plots for each component or other process variable of interest. The bottom area provides various information about each of the components, including the component name, current value, average value, standard deviation, and upper and lower control limits. To replay existing data, simply select "Replay" from the "Mode" pull-down. The pop-up window shown then appears. The name of the run of interest can then be typed into the "Search for" window.



Figure 4  
Run-time window showing "Replay" search screen.

## Historical Window

This window provides access to the database, allowing historical data to be displayed either in its raw form (e.g. spectra) or as time dependent plots of predicted process variables. Searches can be performed by means of any combination of attributes such as time and data, series name, instrument ID, operator, or process stream. The results of a typical search are shown in Figure 5. As with other Proficy RX displays, various operations can be performed on the displayed plots by right clicking on the tags at the right of the screen. In this case three of the spectra are highlighted by changing their data point pixel size to medium.

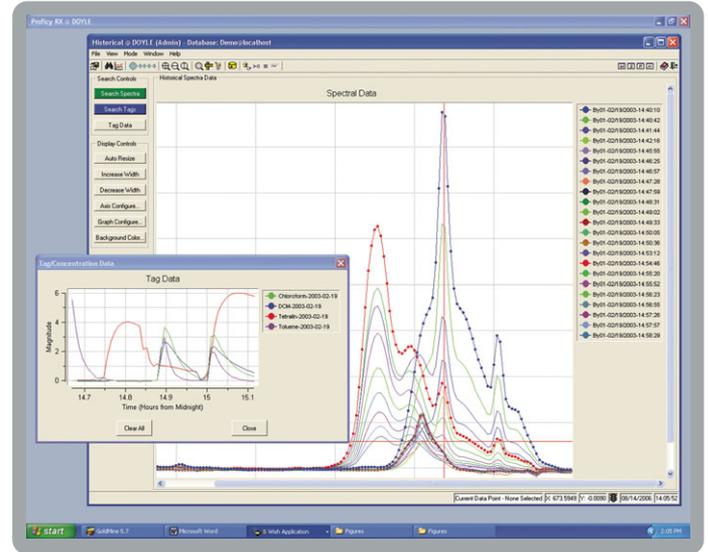


Figure 5  
Historical window showing both spectral and time-dependent displays.

## GE Fanuc Automation Information Centers

Americas:  
1 800 GE FANUC or 434 978 5100

Asia Pacific:  
86 21 3222 4555

Europe, Middle East and Africa:  
800 1 GE FANUC or 800 1 4332682  
or 1 780 401 7717

Europe, Middle East and Africa (CNC):  
352 727979 1

## Additional Resources

For more information, please visit  
the GE Fanuc web site at:

[www.gefanuc.com](http://www.gefanuc.com)

