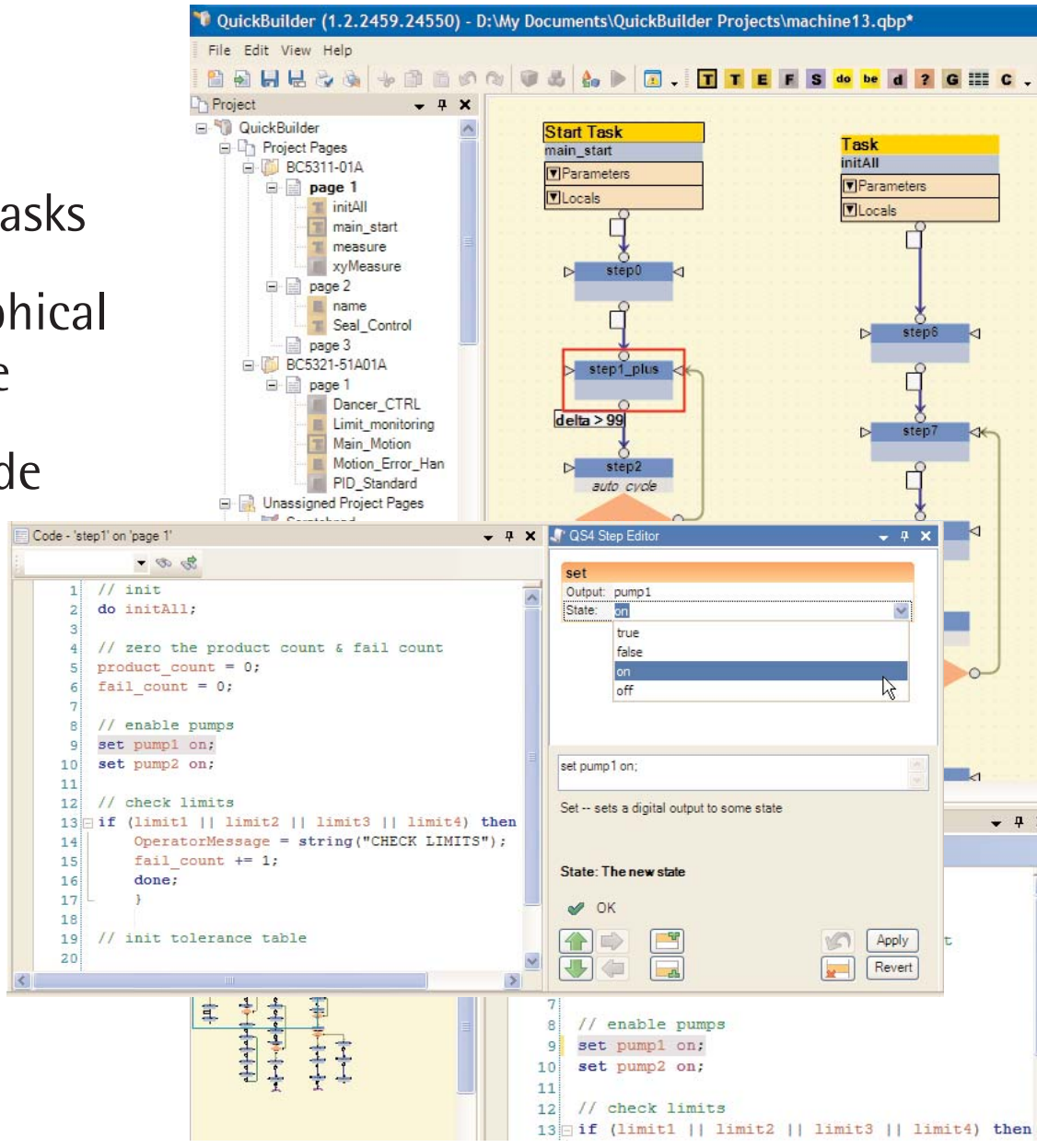
QuickBuilder™

Automation Suite

- Integrates all automation tasks
- Intuitive graphical user interface
- Re-usable code libraries
- So advanced, it's simple



Control Technology

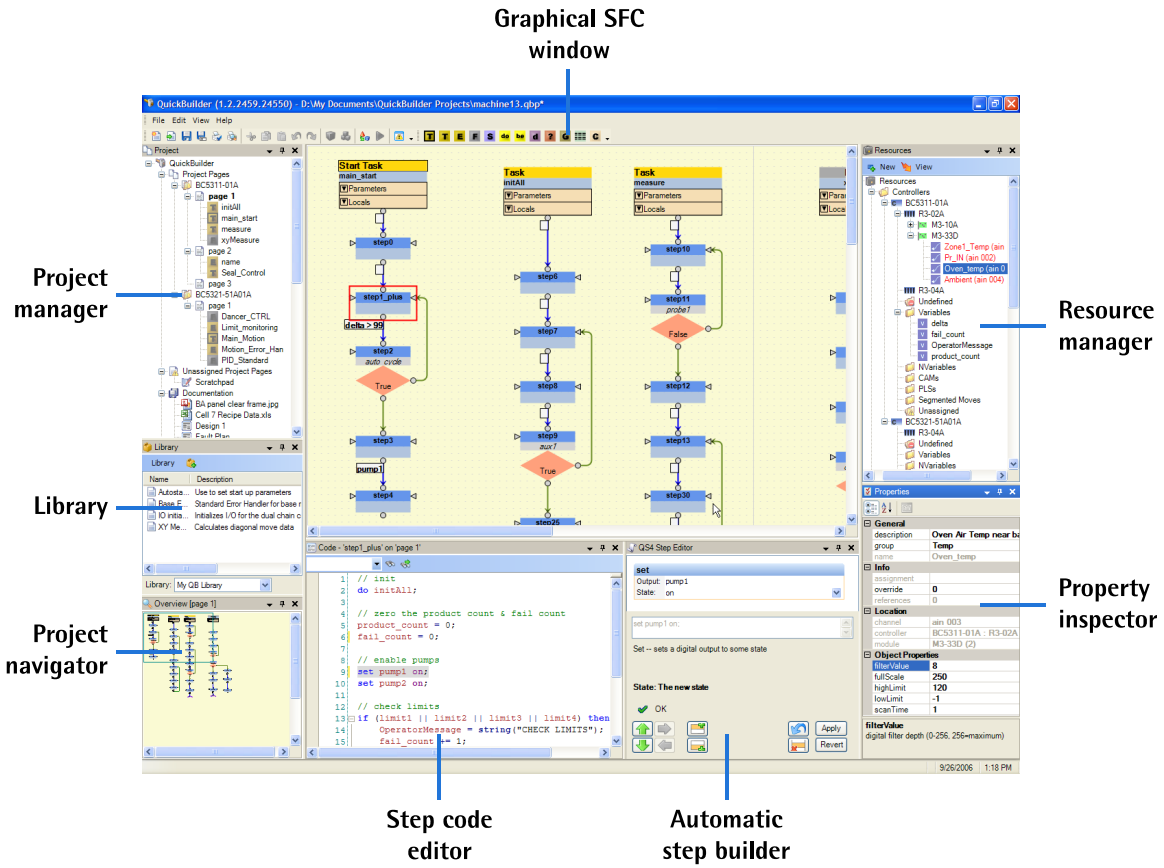
Overview

- Integrates all automation tasks
- Intuitive graphical user interface
- Re-usable code libraries
- So advanced, it's simple

QuickBuilder is CTC's innovative graphical development environment for the 5300 series automation controllers. Using the latest .NET technology, it combines all the aspects of an automation project into one easy to use desktop application. This holistic approach to solving automation projects leads to quicker machine startups and simpler ongoing maintenance.

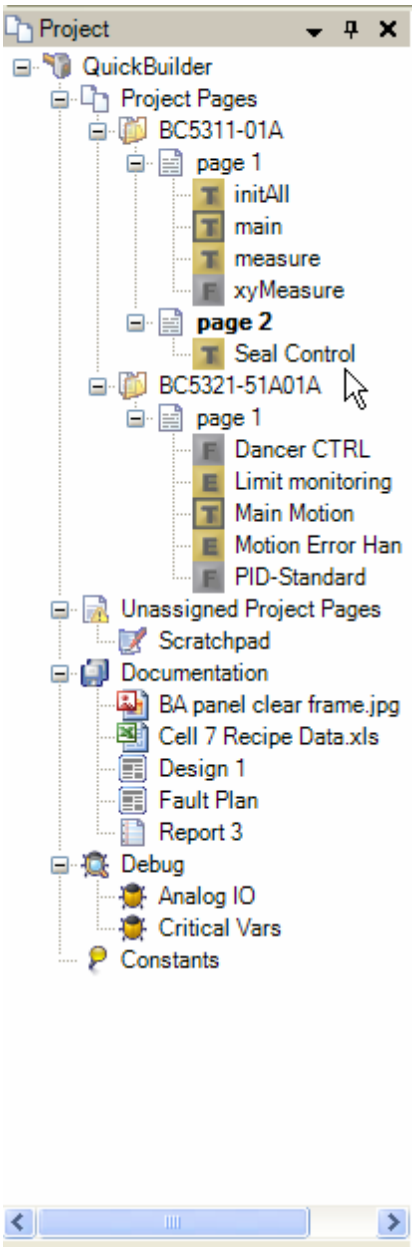
▼ QuickBuilder desktop

The QuickBuilder workspace is divided into multiple windows that give the user a comprehensive view of the project and allow easy access to the various project elements. All of the window sections can be resized and/or hidden to fit individual work preferences. Each user can set and store his favorite layout configuration.



Project manager ▶

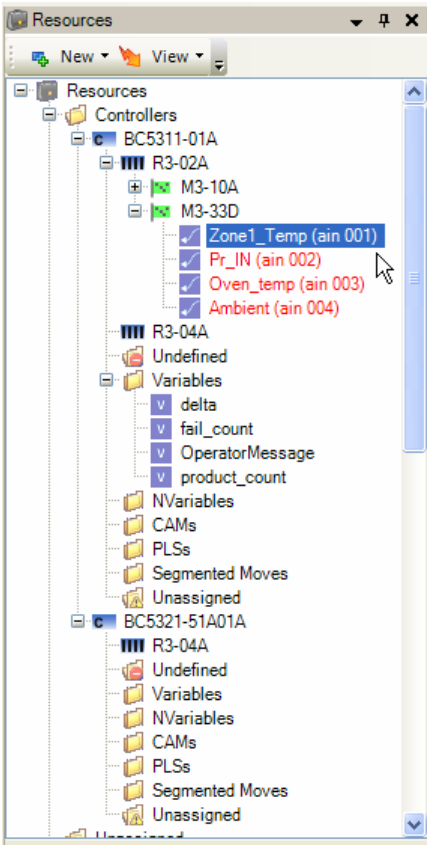
The Project manager provides a hierarchical view of the major program elements in a familiar tree structure. Using the tree's drill-down capability, even large multi-controller projects are easy to navigate. At the top of the tree are the controllers used in the project. The program for each controller is built on logical pages. The page concept offers a convenient way to logically break up the program. A controller can have as many pages as desired. Clicking on a page activates it in the Graphical SFC window. The pages contain the flowchart view of the application, including all of the tasks, events, and functions used. In addition to Controller pages, there is a scratchpad area that is not associated with any particular controller, but rather can be used in developing modules that might be used in multiple places.

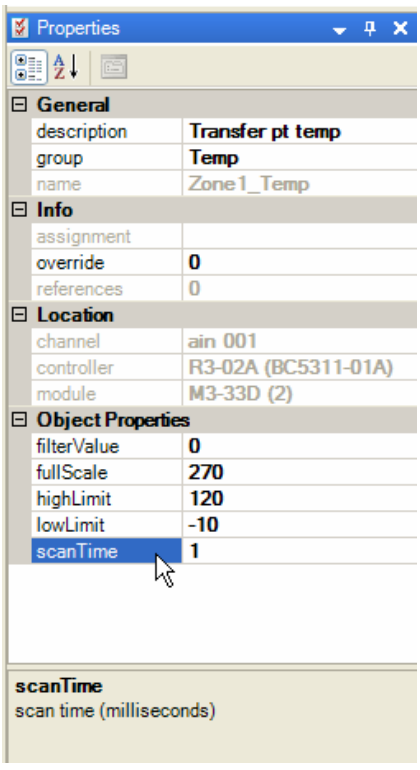


Configuration

Resource manager ▶

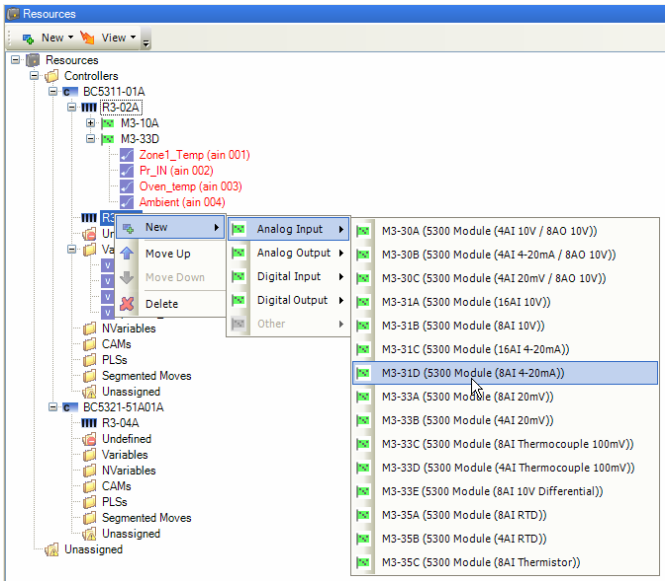
All of the physical and logical attributes of the controller are contained in the Resource manager. Instead of burying this important information within the Project manager, QuickBuilder uses a dedicated window for resource management. This not only provides a clearer view of the project, but it significantly speeds program development. Using the menus and right click functionality, it's easy to set up and configure controllers for the application.





◀ Property inspector

When a resource is selected in the Resource manager window, a link is instantly established with the Property inspector where all of the detailed aspects of the resource can be viewed and edited.

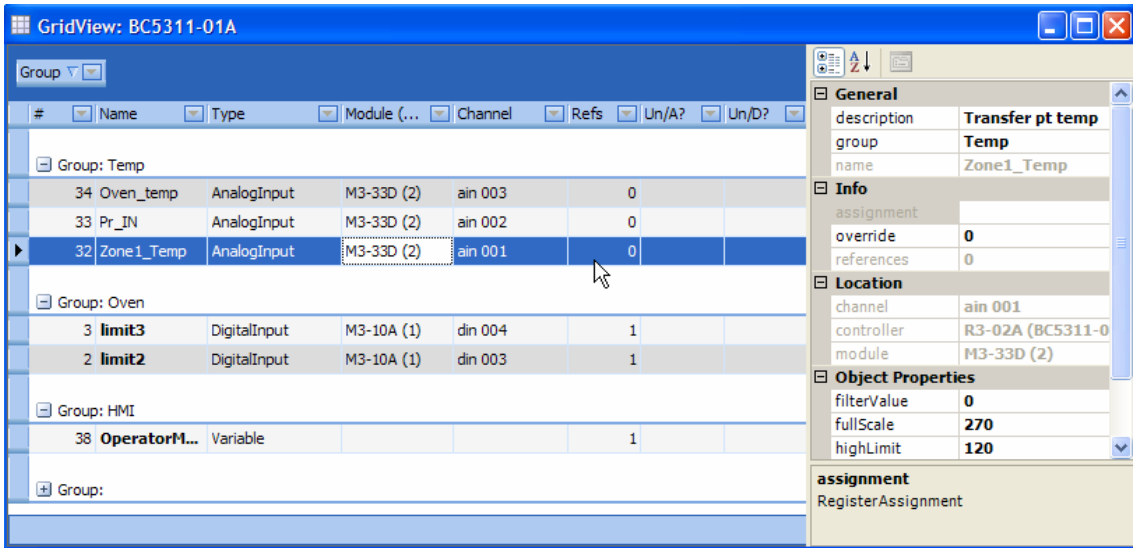


◀ I/O configuration

Right click on a rack and a pick list is presented to populate any available rack slots with I/O, motion or specialty modules. Once entered, modules can be easily moved within a rack or to a different rack.

▼ Grid view

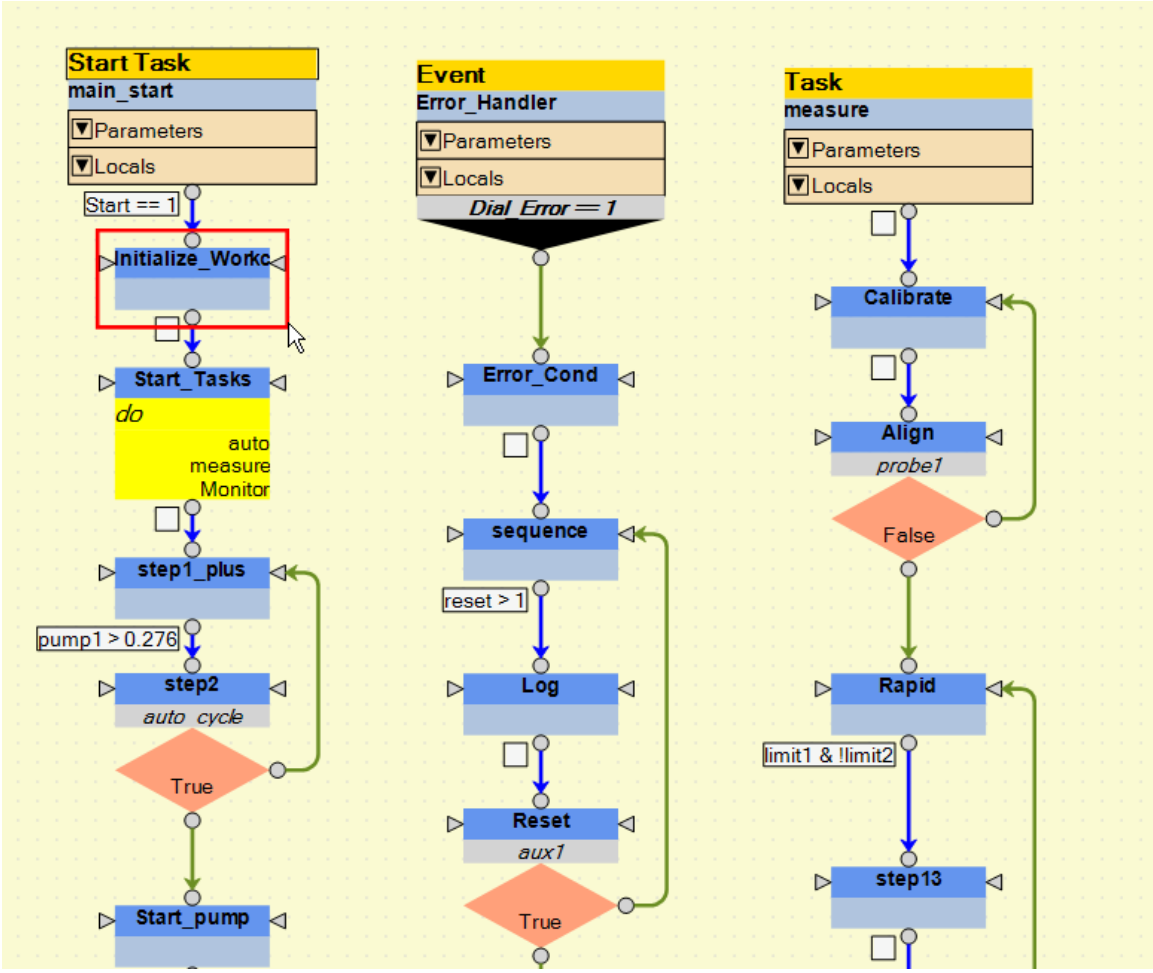
For smaller applications the various tree views are fine, but for larger applications it's nice to be able to sort, filter, and group I/O by various attributes. To facilitate this, QuickBuilder has a powerful I/O grid view window.



Programming

Graphical flow charts

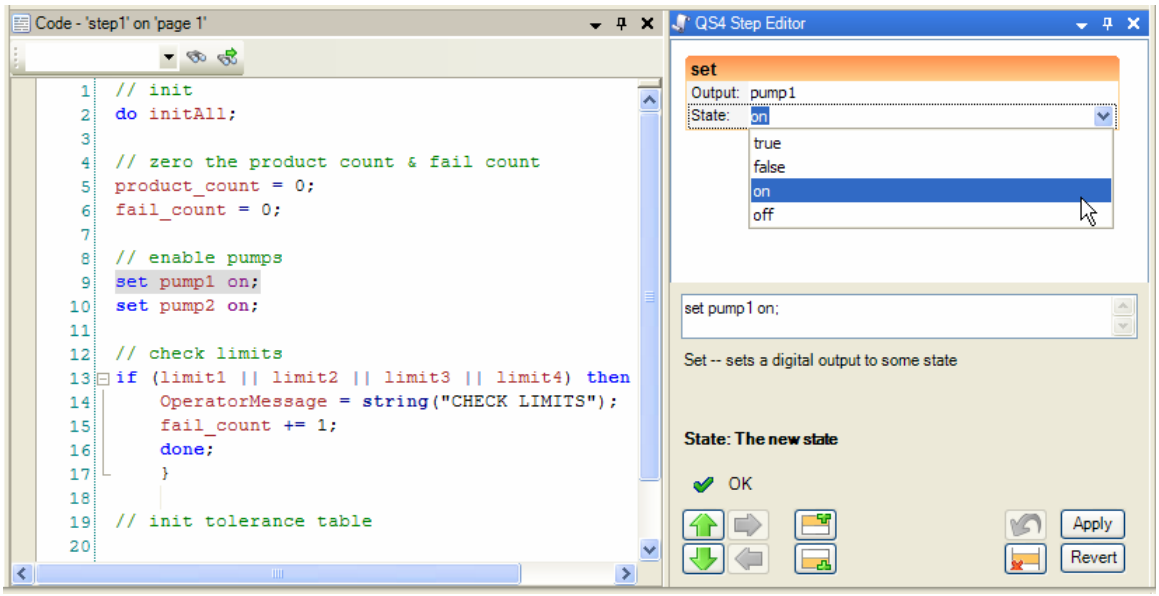
This is where the program development takes shape. Using flowcharting techniques, the major application elements are arranged according to task. Under the tasks are steps that can easily be altered, moved, cloned, or deleted. When a step is highlighted, it is instantly linked to the code window.

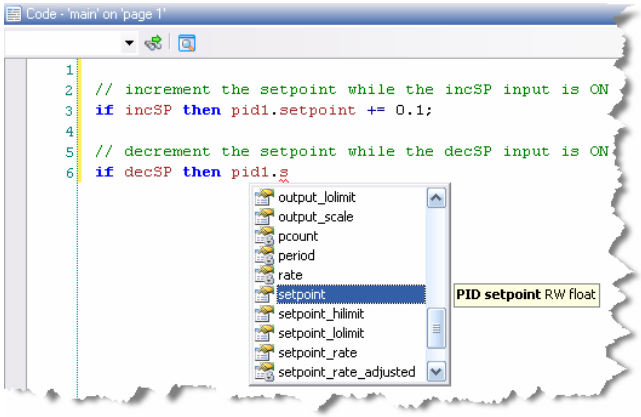


Coding the steps

▼ QS4 step editor window

Once a step is highlighted in the Graphical SFC window, the actual instructions and logic for that step can be created and/or edited in the editing window. Here you have two options: For novice programmers there is an auto step editor that walks the user through the command selection and completion. The resulting code is automatically inserted into the left side code editor window.





◀ QS4 code editor window

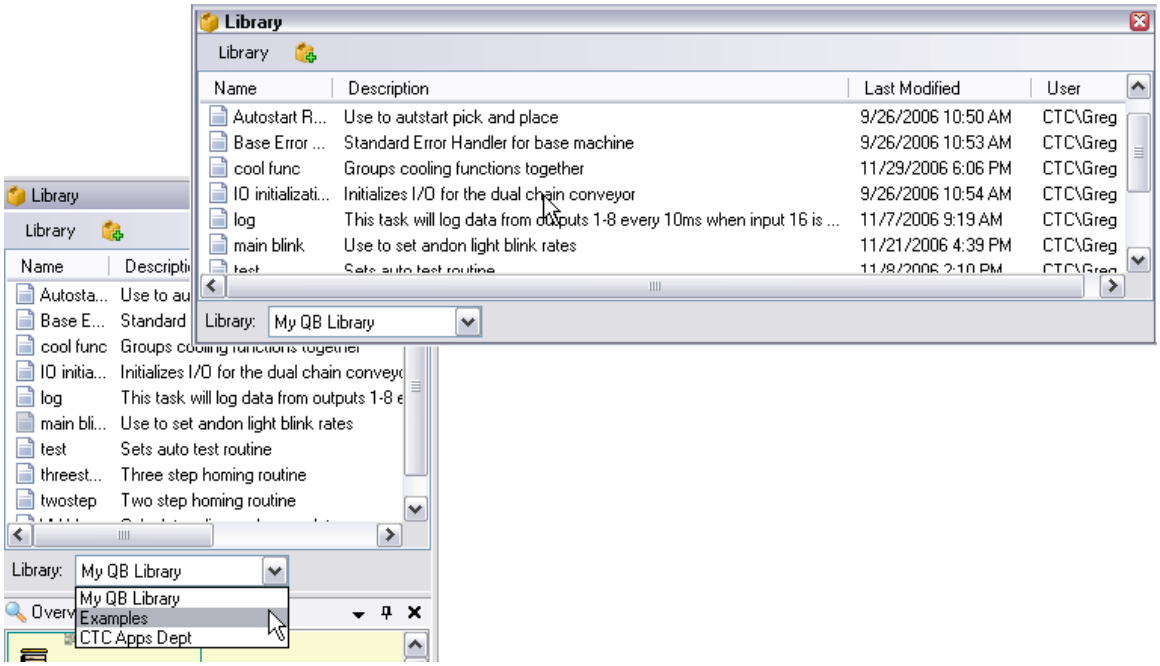
More experienced programmers can skip the step editor and enter code directly into the code editor window. As you type, QuickBuilder's intellisense feature automatically detects key words and checks for syntax errors.

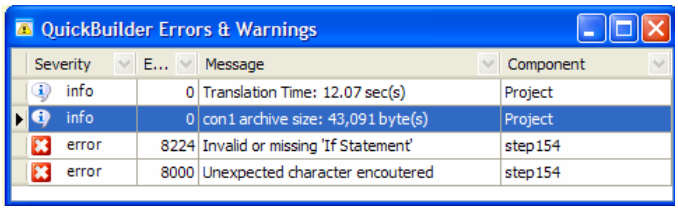
Programming

Programming features

▼ Library window

QuickBuilder's powerful library manager allows individuals and teams to easily share and re-use common code elements. Any portion of a project from a step, to a series of steps, to a task, to an entire page can be saved as a library element. Library elements are stored in a folder that can be located on the local PC or shared server. Multiple libraries can be open simultaneously.





◀ Linked error window

Any errors are flagged by the error handler and can be quickly fixed by clicking on the error. This will take you instantly to the place where the error was detected and offers suggestions to fix the error.

QuickBuilder combines the ease of use of CTC's proven state-based Quickstep language with a graphical implementation of the modular IEC 61131-3 standard. However, unlike traditional 1131 implementations or complex computer languages, QuickBuilder can be learned in a day. QuickBuilder's graphical layout, drag and drop functionality, step completion wizards, bubble help and many other intelligent features all simplify the programming process.

Programming capabilities

- Task control
  - Multiple tasks (up to 96/controller)
  - Individual task control
  - Break, continue
- Events
- Functions
- Subroutines
- Exception handling
- While
- Repeat . . . Until
- For, by
- If, then, else
- Text/string commands
- Full floating point support
- Advanced math and trig functions
- Multiple dimension arrays
- Timers
- Logic functions
- Copy and reuse code segments
- Specialized motion functions

For experienced developers...

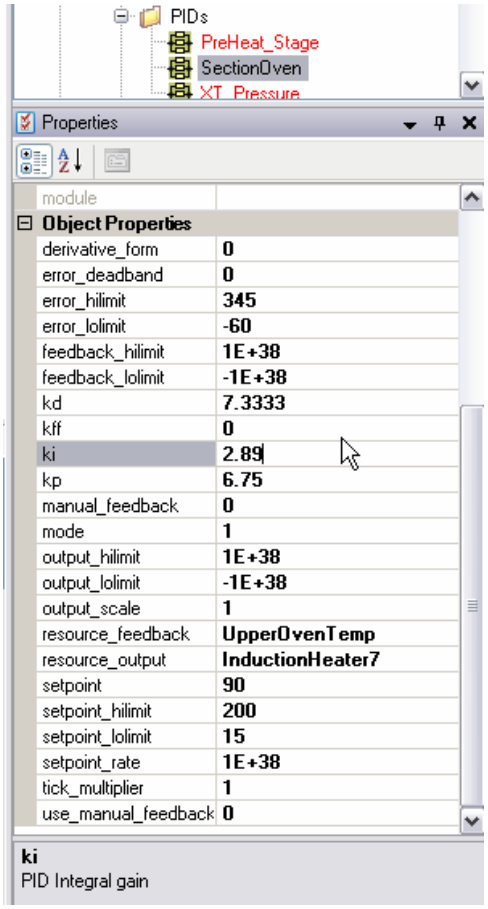
While QuickBuilder was designed to make automation simple for the beginner and occasional user, our software team insisted on including features for the power users as well:

- Abundant use of shortcut keys
- Ability to bypass the Graphical SFC window and type all code in the code window
- Ability to code steps in C

Advanced features

PID control

QuickBuilder provides the user with several advanced functions to simplify common automation applications. Advanced functions like the PID control example below are implemented as embedded functions within QuickBuilder, allowing them to be very tightly integrated with the Model 5300 hardware. This makes them extremely fast and precise. And because they are embedded functions, they do not consume user variable or program step space.



◄ PID Function Example

The PID function allows the Model 5300 to precisely control temperature, pressure or flow rates. It can also be used for simple motion control applications. Multiple PID loops are solved in only a few milliseconds with full 64-bit floating point precision. QuickBuilder can support up to 256 simultaneous PID loops on a single Model 5300 CPU module.

In keeping with QuickBuilder's design philosophy of providing users with powerful control functions that are easy to use, the PID function makes use of an easy to navigate property window for PID setup. When a PID loop is needed, the user simply right clicks on a controller in the QuickBuilder resource window, and then fills in the necessary parameters.

Key features

- Up to 256 PID loops per controller
- 64-bit floating point precision used throughout
- Table-driven setup
- PID and PID (derivative) forms
- Feed-forward
- Integral anti-windup
- Multiple limits and alarms
- Individually settable loop rates
- Programmable error deadband
- Setpoint rate limit
- Manual, automatic and cascade modes
- Minimum loop time of 1 ms
- Pop-up "property" intelligent prompting

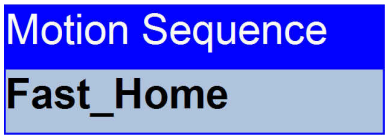
Motion control

- Control up to 64 axes/system
- Stepper or servo
- Powerful motion command set
- Motion code runs asynchronously on each axis module, ensuring consistent high-performance control
- Full user units support

QuickBuilder was designed from its inception to handle both simple and advanced motion control applications. It features a rich command set that is both powerful and intuitive. For example, to move to a position of 67.4" in 3.27 sec after input one goes high, you would write:

```
wait for rise of 1;  move in 3.27 to 67.4;
```

The English-like language combined with more than 100 specialty motion variables makes QuickBuilder motion very easy to learn.



Motion control statements are entered into a special type of step called a Motion Sequence Block, or MSB. An MSB is similar to a function block in that it can be called by one or more axes. As an example, you might create an MSB to execute a specific homing routine. Once created, this MSB can be called by any number of axes.

MSBs can be as simple as a single statement, or they can contain multiple motion, logic and I/O statements. And because they run asynchronously on the motion module, MSB statement execution times are measured in microseconds.

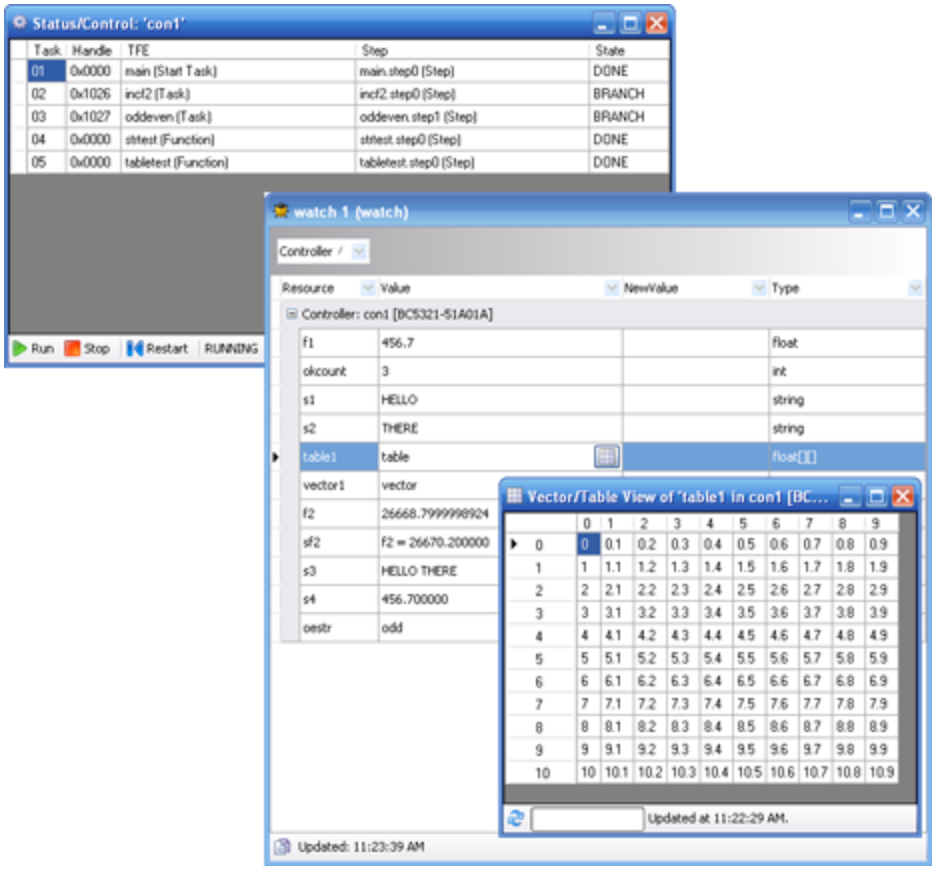


Selected motion commands.

Diagnostics

▼ Watch and control windows

Specialized control windows within QuickBuilder provide the capability to execute and monitor the status of the downloaded program. Standard VCR-like controls simplify the process. QuickBuilder supports multiple Watch windows that can be set up to monitor various resources within the controller. The watch window also allows resource values to be forced to a specific value. The contents of the watch window can be copied to the clipboard and then saved or printed.





QuickScope analysis tool

QuickBuilder incorporates a powerful analysis tool called QuickScope. The QuickScope tool gives developers and technicians an easy way to visualize the real-time operation of one or more Model 5300 controllers. QuickScope combines the features of a logic analyzer and oscilloscope into a single synchronized display, making it much simpler to monitor application performance or perform troubleshooting activities.

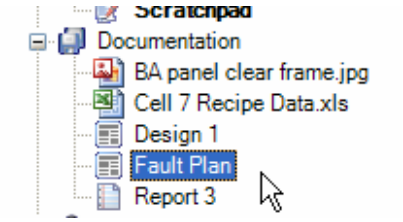
Using high-speed memory within the Model 5300 controller, QuickScope captures the state of 64 digital inputs and 64 digital outputs in the upper logic analyzer window and any 8 named resources (analog, variable, motion, etc.) in the lower window. Items in the lower and upper windows are time synchronized. All designated items are logged at the capture rate which can be as fast as 1 ms. Once the data is captured, it is instantly plotted by QuickScope in full color. Data can be quickly analyzed using the zoom, scroll, and multiple cursor features.

To aid in documentation or for further analysis, QuickScope captured data can either be exported directly to Excel or the QuickScope traces can be published as a PDF document. QuickScope is built into QuickBuilder, CTC's powerful graphical development environment.

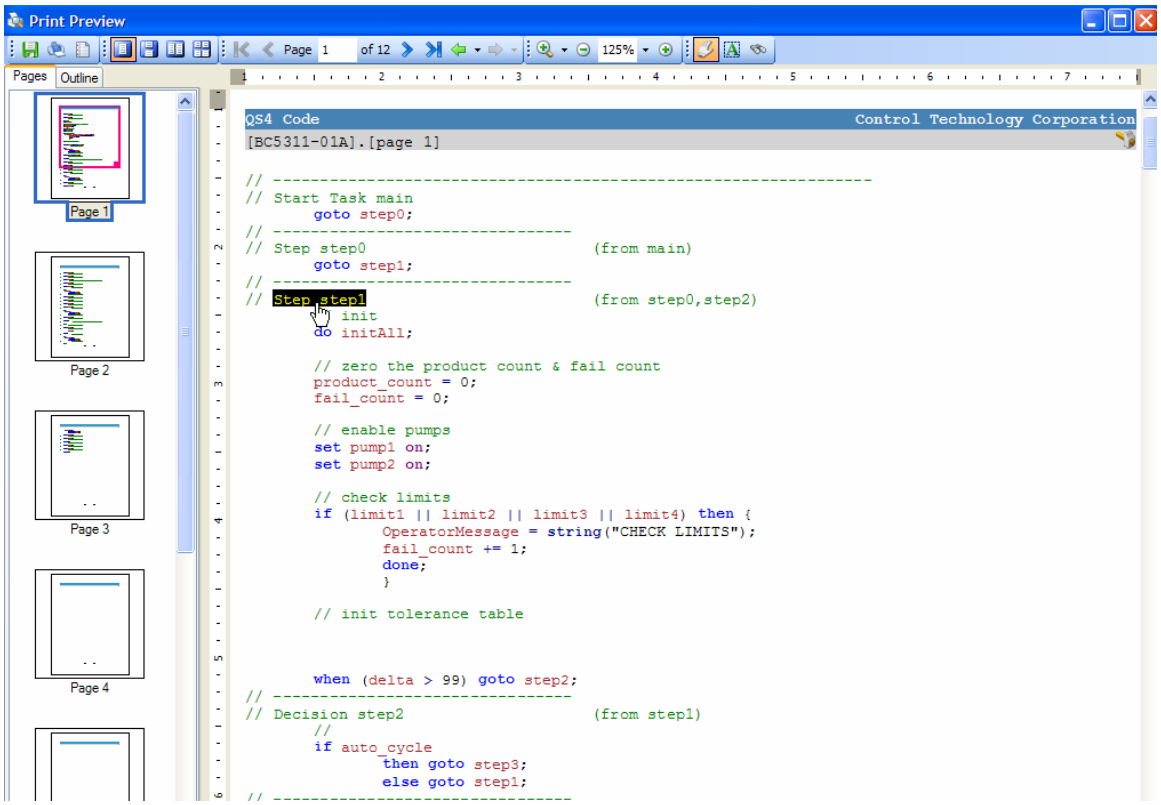
Key features of QuickScope

- Capture rates as fast as 1 ms/point
- Each capture contains up to:
  - 64 digital inputs
  - 64 digital outputs
  - 8 user selectable resources
- Scroll and zoom functions
- Import and export to Excel
- Document capture in a PDF file
- Open multiple QuickScope instances
- Select any controller on the network
- Set triggers within QuickBuilder code
- Y-scale value cursor
- Dual X-scale measurement cursors
- Auto detects all named resources in the active Model 5300 project

Documentation



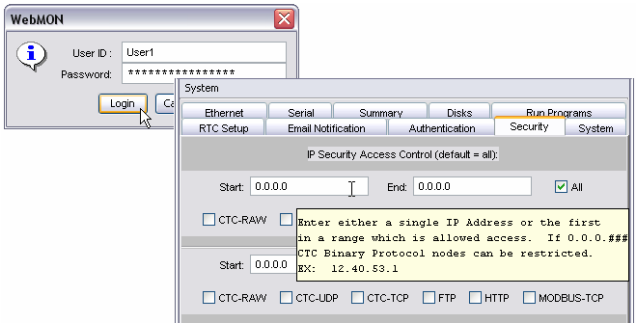
Documentation files can be internally generated by QuickBuilder using features such as the auto report generator or the in-line documentation tool. There are several customizable reports built into QuickBuilder including the graphical view, the code listings, and resource cross reference lists. QuickBuilder reports have embedded hyperlinks that link to the referenced item, speeding the debug process. Additionally, externally generated files such as CAD drawings or text documents can be added to the project by dragging them from Windows Explorer into the documentation section of the Project manager.



Auto generated report showing hyperlink to step 1.

Security features

TThe Model 5300 is equipped with a robust multi-level security system. Its built-in features ensure that the controller is only used in the manner originally intended by the system designer. Security features include:



Access Control

- Requires valid name and password
- IP filtering can restrict access to specific IP addresses

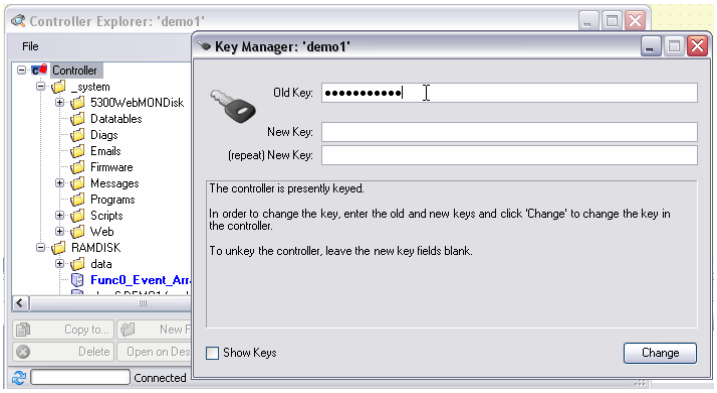
Project download & edit control

Project upload and view control

Project encryption

Keyed access control

- Controller can be given a user-defined 56-bit key
- Projects can be given a user-defined 56-bit key
- Only projects with a key identical to that of a keyed controller can be loaded into that controller
- Projects stored on a keyed controller can only be accessed with the key
- Keys are securely written to non-volatile EEPROM (no battery)



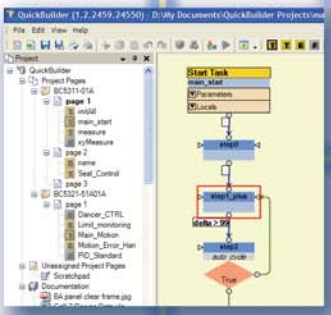
Security and audit features

- Name and password access
- IP access filtering
- Controller and project keying
- Only projects with matching 56-bit key can be loaded
- Project and file encryption
- Project validation via 32-bit CRC
- Edits tagged with domain, name, date, time
- Revision archiving













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