RS Block – A module of RS LabSite®

Multi-Axis Cyclic Testing with Monitoring and Analysis

IST INSTRON STRUCTURAL
TESTING SYSTEMS

The Solution for Multi-Axis Block Cyclic Testing

The RS Block module of RS LabSite® provides command signal generation, monitoring and data acquisition for single or multi-channel tests. Control channels can be operated individually or assigned in test groups in any combination desired, making this a very flexible tool for use in a structural test laboratory.

Test programs can consist of simple definitions of sine waves, a series of defined sine wave blocks or highly complex test sequences, including control of auxiliary devices such as temperature chambers. A program can include detection of specific events with defined actions, for example *pause until a defined temperature threshold is met*, as well as conditional branches to the test sequence. In all cases, data acquisition provides a permanent record of the tests.

RS Block Applications

The most frequent application performed by RS Block is the control of cyclic block tests. These consist of a defined series of sine waves in blocks, each block comprising a number of cycles at a defined frequency, amplitude and mean level. The automatic peak value control and the ability to build sequences with repeats and nesting are particularly powerful features of this application.

The capability to control external devices and data acquisition allows complete automation of test sequences. The possibility of building arbitrary sequences from segments enables the programming of custom test profiles.

RS LabSite® Software Suite

2
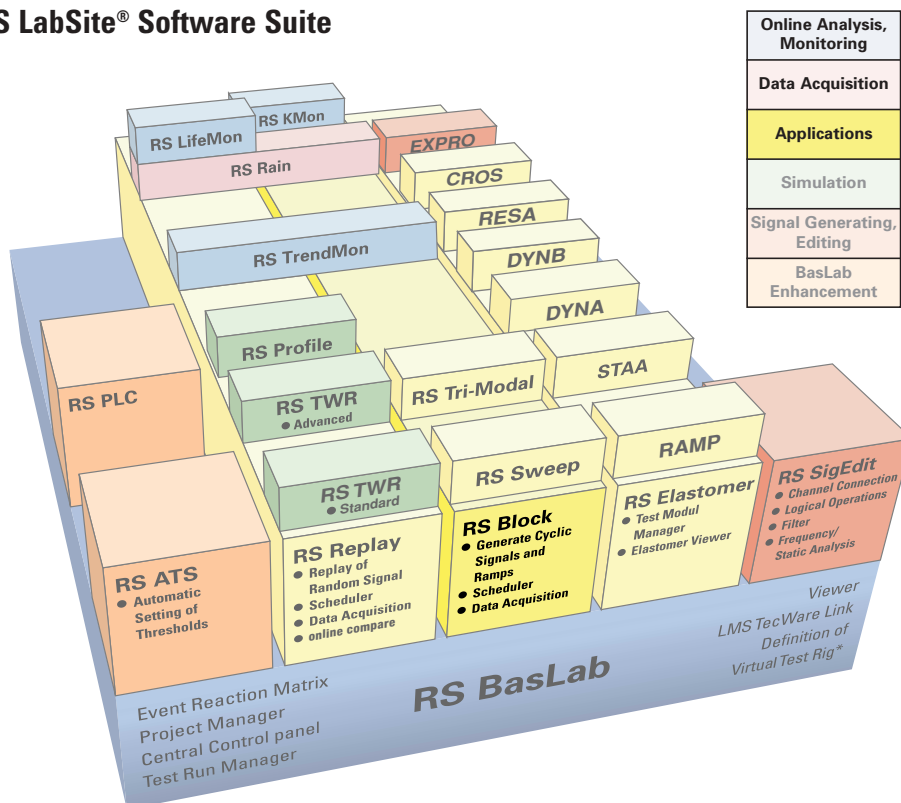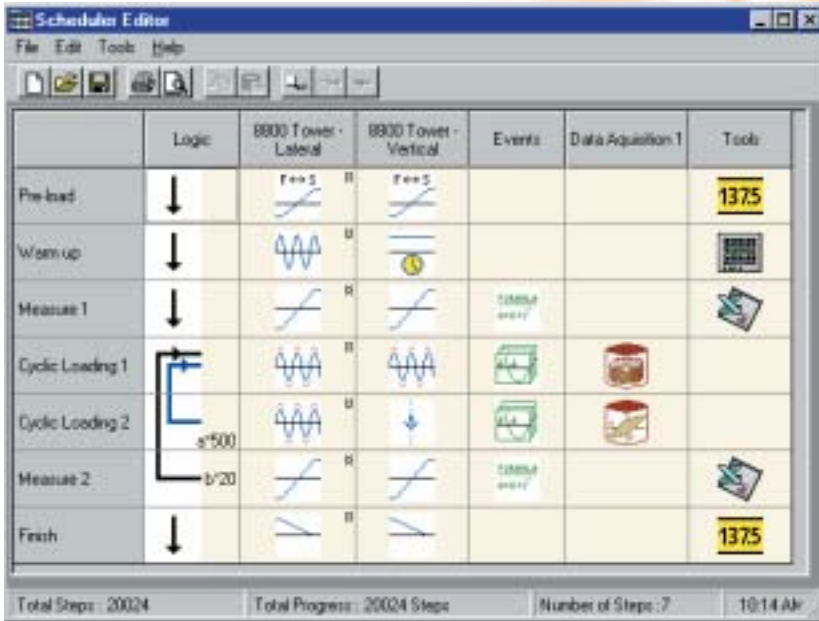
Scheduler

RS LabSite's Scheduler facility is used to create test sequences. A graphical environment provides an intuitive interface for the design of simple or complex test sequences. In addition to the Demand Signal Generation, Data Acquisition, Test Logic and Events functions, access to other testing software can be built into a test program through use of the Tools facility.

A typical demand signal in RS Block consists of a cyclic waveform along with the data acquisition in hysteresis mode. If time history replay is desired (using RS Replay), the demand will be a digital drive file, with the acquisition in synchronous mode. RS LabSite Scheduler has the unique ability to define sequences which combine both of these methods in a single test. The debug mode with single step and hold is very useful for verifying the test program.

Test Definition

Tests are programmed step-by-step using the Scheduler utility. The graphical programming environment enables intuitive operation for simple or complex test sequences. Each step defines the controller channel and mode, command signal, data acquisition, and event logic. Modification of programmed test parameters such as the function generator frequency is possible during the test run.
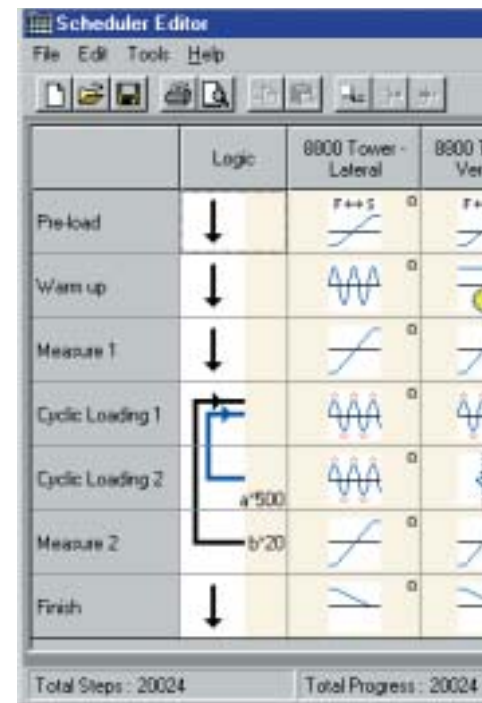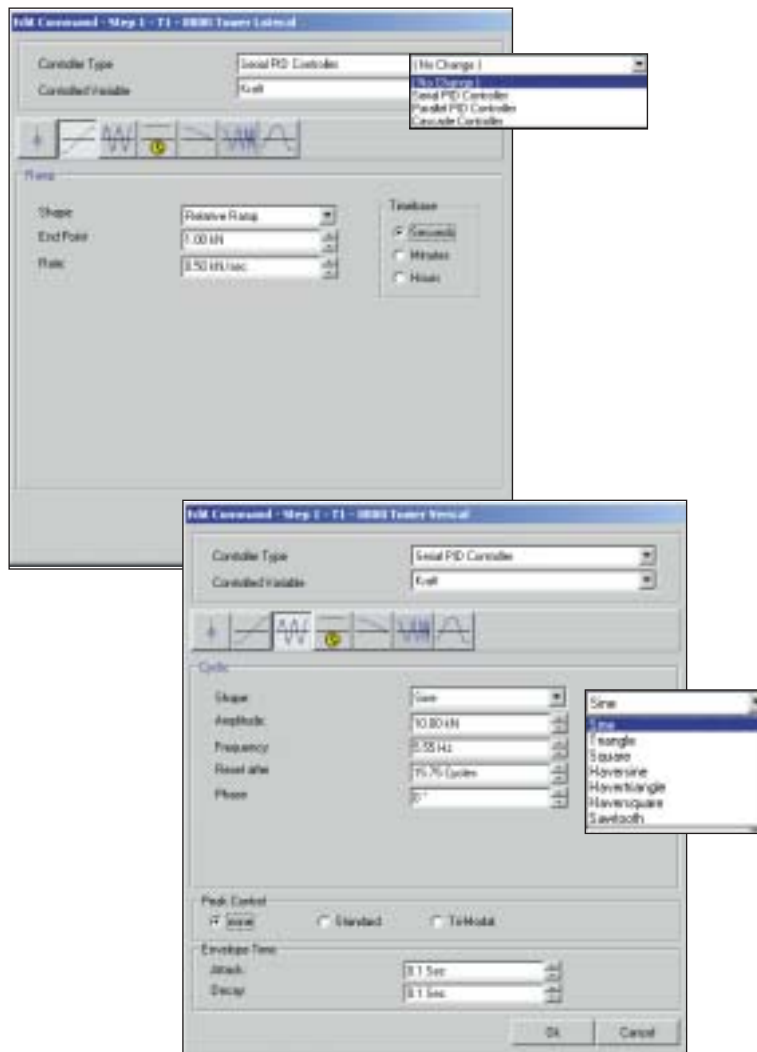
Demand Generation

With RS Block, cyclic block programs can be defined for single or multi-channel tests. The programs operate by controlling the function generators in the Labtronic family of controllers, and specify the following:

- Amplitude
- Frequency
- Number of cycles
- Waveform (sine, triangle, square, haversine, havertriangle, haversquare and sawtooth)
- Phase shift between channels
- Activation of peak value controller
- Ramps (relative, absolute and final value)
- Dwell time

Tri-modal is available for cyclic signals only. It adjusts the setpoint and amplitude of the signal generator to achieve the desired parameters. Five combinations of parameters are supported:

- Peak/Peak
- Peak/Mean
- Mean/Amplitude
- Min Peak/Amplitude
- Max Peak/Amplitude

It is possible to define Peak and Amplitude relative to the current value at the beginning of a step.

■ Trapezoids are ramps defined by 2 end points, 2 rates and 2 dwell times.

The individual blocks are combined into an overall test program using Scheduler. This overall program thus benefits from all the power of Scheduler and also includes control of auxiliary devices.

Logic

Scheduler allows the creation of program loops with repeats and up to three-deep nesting.

Events

Event detection with programmable action provides a powerful tool for test automation. Events can be triggered by the program or by detection of digital inputs, threshold with settable level and slope, or user defined conditions. Possible actions include controller functions, digital output trigger, or user defined action.

Threshold detection is frequently utilized for setting safety shutdown limits, and is separately programmable for each block.

Other examples include stopping a ramp at a pre-defined load level, or pausing until a pre-set temperature is met.

■ RS Sweep (Option) allows linear or logarithmic sweeps of frequency and phase. Users can configure an up or down sweep. Sweep supports wave shapes of Sine, Triangle, Square and Haversine.

■ RS Tri-modal Amplitude Control (Option) allows users to perform advanced peak control, where the control mode and maximum and minimum peaks can be defined in different modes. For example the minimum peak can be defined as a load and the maximum in terms of strain, whereas the controller runs in position control.

Test Definition

Data Acquisition

Data acquisition with RS Block is very flexible and can be triggered automatically by the program or detected events, as required.

"Snapshot" Mode

Data acquisition for single or multi-channel, with defined parameters, can be triggered by program events. These events include keyboard input, limit value, digital input and program software.


Defined parameters consist of data rate and points or time. Parameter definitions can vary for different control loop boards. Digital filtering is performed with selectable cut-off frequency, filter order and type (Butterworth, Bessel and Chebyshev). The data is then stored from a ring buffer with settable delay, which allows retention of data collected before and after the event is detected.

Hysteresis Loop Mode

The hysteresis loop mode stores individual cycles periodically throughout the test, with settable number of cycles, samples per cycle, and filtering. Data can be taken:

- At linear intervals

- At logarithmic intervals

- At intervals defined by a table
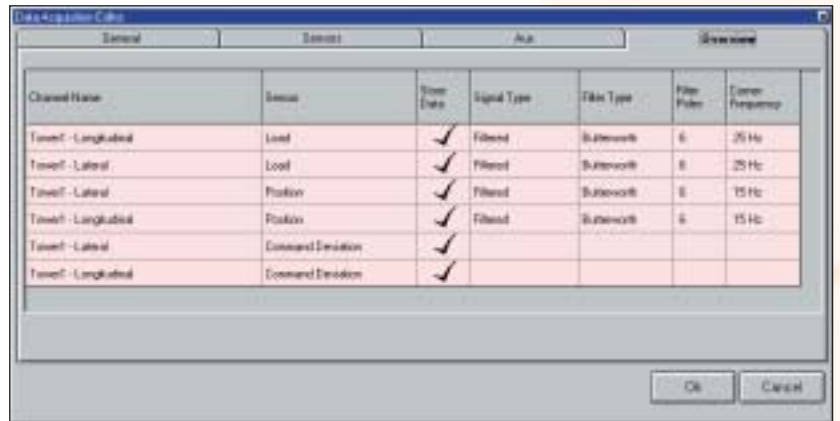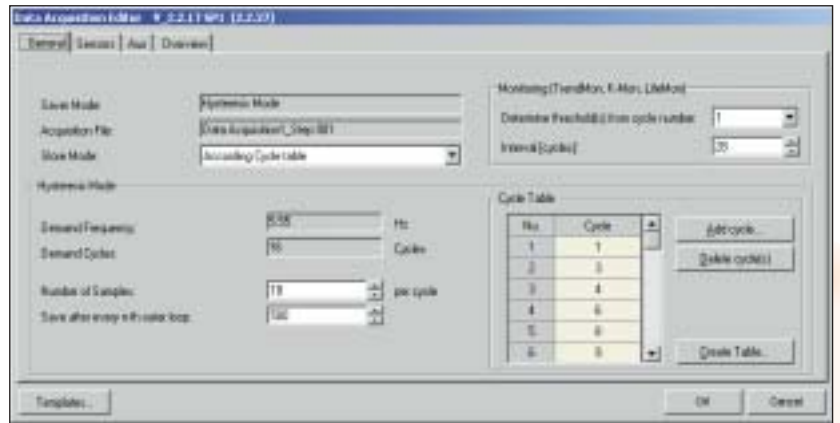
Tools

The program can activate tools such as the digital voltmeter or the oscilloscope application for online display. It also features the capability of calling and controlling external programs such as Microsoft® Excel, which could be used to automatically plot the results of a characterization test.

## Optional Test Monitors

■ RS TrendMon
Calculates statistics from data such as Max, Min, Amplitude, Standard Deviation etc. logged using hysteresis or snapshot acquisition mode with RS Block. RS TrendMon calculates the statistics for a hysteresis measurement or for an entire user-defined time interval. It monitors the changes in these statistical values and can trigger test actions such as warn / pause / stop if pre-set thresholds are exceeded. Thresholds are entered either directly or are defined by a tolerance and a reference value. The user can define after which hysteresis measurement or how many seconds of the demand signal the reference value is determined. Thresholds may be changed online.

■ RS Rain
Calculates online rainflow matrices from acquired data. One matrix file is produced per test run, and can be displayed online while the test is running or offline after it has finished. Matrices can be displayed as 2D or 3D histograms. The matrices may be converted to range pairs, peak count or level crossing distributions to simplify comparison.

■ RS KMon
Calculates dynamic stiffness and other elastomeric characteristics from data logged using hysteresis acquisition mode with RS Block. It monitors the changes in these characteristics and can trigger test actions such as warn / pause / stop if pre-set thresholds are exceeded. Thresholds are entered either directly or are defined by a tolerance and a reference value. The user can define after which hysteresis measurement the reference value is determined. Thresholds may be changed online.
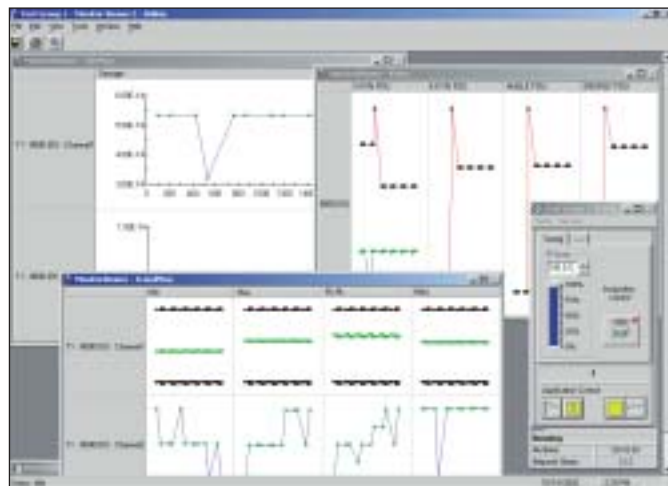
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ACCELERATING THE DEVELOPMENT PROCESS

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