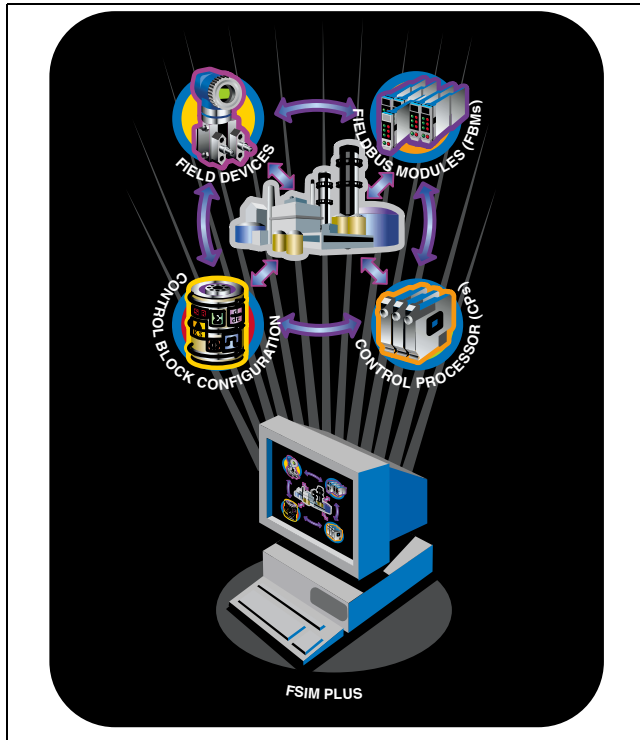**FOXBORO**®

I/A Series® Software
FSIM™ Plus

FSIM PLUS

FSIM Plus is a tool for off-line simulation and testing of I/A Series control software designed by The Foxboro Company. Using FSIM Plus, an entire I/A Series system can be fully tested and verified without tying up the full complement of system hardware. This means that integrated system software testing can proceed independently of the shipment and installation of control and I/O subsystems at the target process unit. This system testing method can compress project schedules. In addition, the ability to perform an integrated system simulation and software test results in significantly higher software quality. Higher quality software translates into fewer field commissioning problems and significantly reduced field commissioning time. The cost benefit of saving time alone often far exceeds the cost of adding FSIM Plus to an I/A Series system.

BACKGROUND

In today's competitive market, many automation projects are pressed for time to conduct exhaustive control software testing. When a new project is installed in the field, the schedule is guaranteed to be short and any delay is costly.

What does that mean to the control system engineer or developer? The control configuration needs to be 100% accurate when it arrives at the site. Errors with the controls or problems with the logic must be detected early and corrected. If uncorrected software errors remain during commissioning, expensive startup delays result.

Under these demanding constraints, debugging the control configuration in the field is to be avoided at all costs. All testing and validation must be completed off-line and in most cases off-site.

FSIM Plus gives I/A Series software users the capability to test and verify the actual, unmodified control system configuration in an off-line simulation environment before or after the I/A Series system has been installed in the field. FSIM Plus includes a process-modeling tool and a direct interface to the I/A Series system, which makes it the ideal solution for control checkout and simulation.

FSIM PLUS FEATURES

FSIM Plus provides identical functional capabilities as an I/A Series control processor (CP). All operational and engineering applications, all processes, and all equipment that can run with an I/A Series control system can also run with FSIM Plus. This is possible because FSIM Plus is created from an actual version of I/A Series control software with components added for simulation and testing.

FSIM Plus acts as a virtual CP, fully emulating an actual I/A Series CP. However, the control configurations from many CPs reside in a single emulated CP. As a result, a complete control system configuration can be simulated, tested and improved independently of the I/A Series control and I/O hardware.

Invensys™

Product Specifications

FSIM Plus uses standard Foxboro configuration software (for example, ICC, ICC Driver, or FoxCAE™) to develop, test, and improve the control configuration. This fully tested control configuration is then loaded directly into the target I/A Series system, without modification.

FSIM Plus supports all I/A Series block algorithms. This includes all algorithms that execute in I/A Series CPs, device integrators, and programmable logic controller integrators. The virtual CP also emulates all the Fieldbus Modules (FBMs) in an entire control system.

The I/A Series ladder logic, sequence of events (SOE), and motor drive actuator (MDACT) logic, which normally execute in the FBMs, are fully emulated by FSIM Plus. The FBM emulation receives its configuration data in exactly the same manner as an actual I/A Series FBM – through the ECB.

SIGNAL CROSS-REFERENCING UTILITIES

The system's field input and output signals are driven in FSIM Plus by data that is generated by a simulation model. In the FSIM Plus environment, the exchange of I/O data between the I/A Series control blocks and the simulation model is defined through a cross-reference database.

The cross-reference database contains, among other things, the definition of each model parameter, scaling factors, and the I/A Series I/O point. A powerful set of cross-reference utilities and an editor is included with FSIM Plus.

In the FSIM Plus implementation, the cross-reference database is populated using the actual control configuration. Some of the features provided by the cross-reference utilities include:

- Dynamic loading of cross-reference changes to expedite parameter tuning during testing
- Control point and model parameter verification
- Simulation of various I/O malfunctions
- Ability to service points at different time intervals.

PROCESS SIMULATION

Through the use of a simulation model, a wide range of representations of the process can be generated for testing, validation, and training purposes. Simple models can be built through the use of transfer functions or physical flow networks. These simple process models can be configured and saved as templates. They are accessible through the graphical user interface (GUI) and provide a quick means to create "tie-back" simulation models.

By selecting the template, entering the configuration data, and connecting it to the control variables with the cross-reference database, engineers will quickly be on their way to checking out a control system configuration.

SPECIAL SIMULATION FUNCTIONS

The functionality of the virtual CP has been enhanced to include numerous special capabilities that aid in control system testing and validation.

Run/Freeze

Operation of the simulation and the controls can be frozen using the simulation interface. The run and freeze function allows the engineer to stop or freeze the current testing procedure. Freezing the simulation gives the engineer indefinite time to view an instantaneous state of the control system.

Single Step

The single step capability allows the engineer to run the model in 1/4 second time steps. A wide range of control issues including equipment trips and stability issues, can be more easily diagnosed by using the single step mode.

Simulation Speed

The simulation speed feature increases or decreases the rate at which the simulation proceeds. The minimum simulation speed is 25% of real time. The maximum speed at any given time depends on the simulation load.

Using the simulation speed capability, slow processes such as equipment warming or fill phases can require minutes instead of hours to fully simulate and test. The simulation speed can be adjusted at any time to suit the testing requirements of any process state.

Save/Restore

The current state of the entire simulation and control system can be captured as an image and saved for later use. These functions allow the engineer to save particular scenarios for testing or training purposes. If the tests are not successful, the scenarios can be restored and the test can be repeated. The process continues until an acceptable control response is implemented.
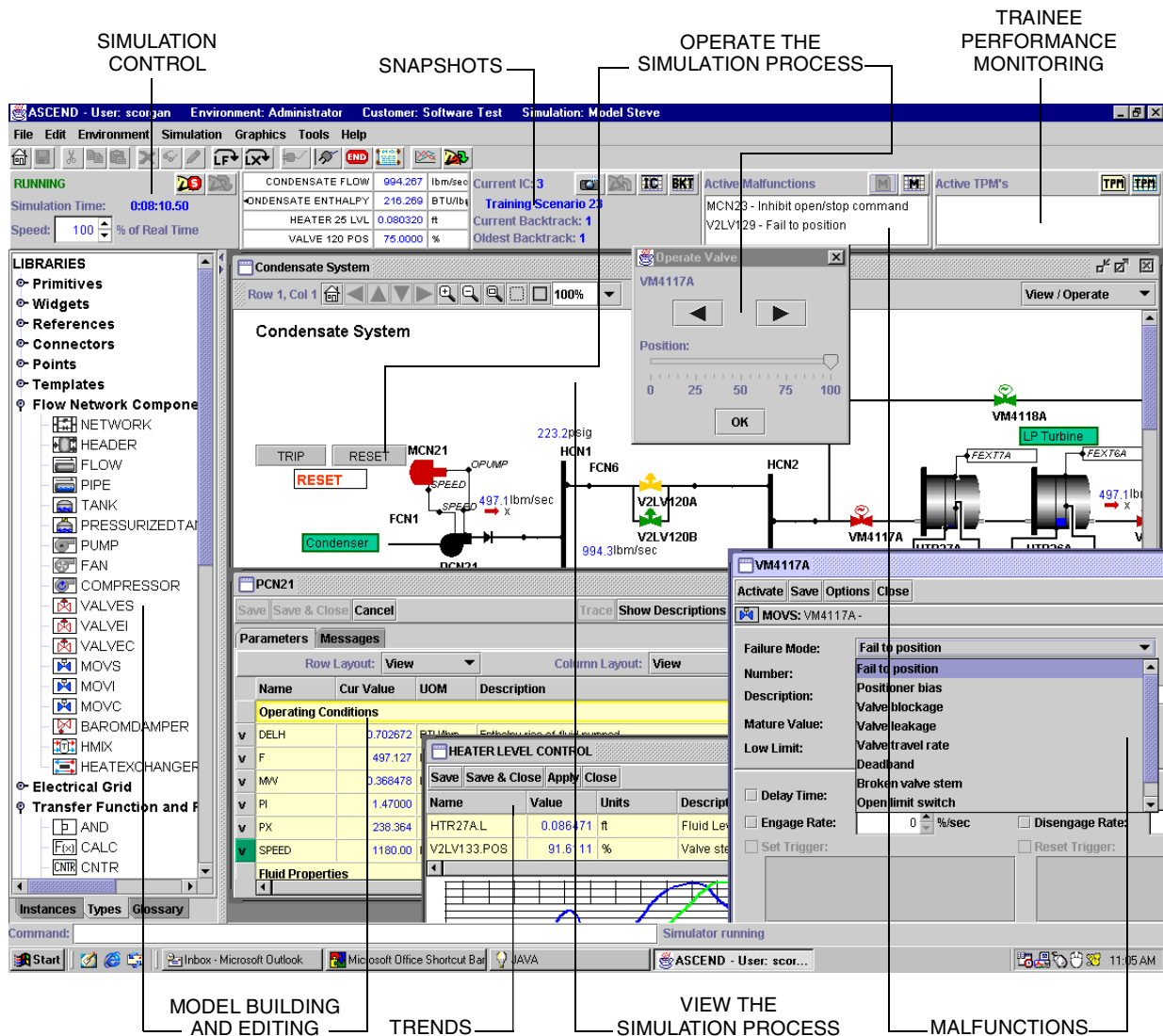
SUPPORTED I/A Series STATIONS

Support for the I/A Series system Allen-Bradley station, Allen-Bradley integrator, Modbus integrator, and device integrator is a standard part of FSIM Plus. Configurations from any of these stations can be loaded directly.

Optional PLC emulation packages are supported in the FSIM Plus environment. The available PLC emulations are:

- Allen-Bradley PLC-5
- GE™ Mark V
- GE PLC-6
- Modicon™ PLC-984
- Woodward Governor

LICENSING

FSIM Plus software licenses are scaled according to the number of CPs emulated. The breakdown is as follows:

- FSIM Plus
  - # of CP40s/# of CP60s

- FSIM Plus Lite
  - 1-2/1

- FSIM Plus Standard
  - 3-15/2-7

- FSIM Plus Extra
  - 16+/8+

An FSIM Plus license includes:

- The CP run-time environment

- The process-modeling package

- Cross-referencing tools

- Device integrator support

- An application program interface (API) for integration with external process models.

PRODUCT CONFIGURATIONS

The minimum set of hardware required to implement FSIM Plus includes:

- one I/A Series Application Workstation 51 or Application Workstation 70 with standard software

- one Sun™ Ultra 5 workstation for housing FSIM Plus[1]

- two Foxboro dual nodebus terminals with cables[2]

- one Foxboro 1x8 mounting structure.

Any number of operator consoles (workstation processors), printers, and so forth can be added to the Nodebus with no affect on the functionality of FSIM Plus.

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(1) A Sun Ultra 5 is typically used for the FSIM Plus workstation. For systems running FSIM Plus Extra, a Sun Ultra 60 may be required.

(2) All Sun Ultra stations connect to the Nodebus through a DNBT. The Ultra 60 can use either a dual nodebus terminal or a dual nodebus interface. All Sun Sparc stations connect through a dual nodebus interface.

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