The Type ACS201 P1.0 Intelligent Fuzzy Logic Control (IFLC) software product is part of the Advanced Control Solutions (ACS) from Fisher-Rosemount Systems, Inc. The IFLC product uses fuzzy logic algorithms to improve control loop performance. With autotuning functionality, the IFLC provides superior performance for a variety of applications. The illustration below shows how this product works with the other ACS products.

The fuzzy logic controllers that make up the IFLC product are a direct substitute for traditional PID controllers. Each fuzzy controller has three parts: input signal translation to fuzzy values, a rule inference engine, and a retranslation process to continuous control signals.

**Product Description**

The IFLC product (U.S. Patent Pending) is composed of one or more fuzzy controllers and an automatic tuning capability that uses the ACS401 Intelligent Tuner to provide process dynamic information. This product allows operators to switch on-line between PI/PID/I control and autotuned fuzzy logic control simply by changing the mode of the loop to direct digital control (DDC).

The IFLC uses predefined rules and adjustable parameters known as *scaling factors*, which are automatically tuned for optimal performance. The IFLC issues control actions through the DDC mode of the loop point.

The product consists of one custom display, six or more PROVOX points, an optional Help display, faceplate displays, and a user manual. An installation utility program produces ENVOX® configuration data to be integrated with the user configuration database and downloaded to 20-Series controllers or 20-Series SR90 controllers and PROVUE® or Operator Workplace (OWP) consoles.
Product Benefits

- Provides faster, tighter control
- Minimizes overshoot
- Works with the ACS401 Intelligent Tuner
- Adapts tuning parameters
- Optimizes disturbance rejection

Minimizes Overshoot

The nonlinearity built into the IFLC reduces overshoot and settling time, achieving tighter control of the process loop. Specifically, the fuzzy logic controller treats small control errors differently from large control errors and penalizes large overshoots more severely. It also severely penalizes large changes in the error, helping to reduce oscillation.

For example, the trend traces shown are for a process with some deadtime. The PID loop has been tuned for minimum integrated error without concern for overshoot in the first trend trace and tuned with no overshoot allowed in the second. For the PID controller to achieve no overshoot, it must be detuned, which results in a slower response.

Works with the Intelligent Tuner

The autotuning functionality of the IFLC makes fuzzy logic technology easy to use, without requiring operators to understand fuzzy logic theory.

The IFLC uses the ACS401 Intelligent Tuner to apply relay tests to a process loop which identify the process critical gain and critical period. The product then uses this information to calculate the optimal scaling factors for a fuzzy logic controller on demand.

Adapts Tuning Parameters

When there is a setpoint change, the IFLC automatically adapts its scaling factors for the best response for that magnitude of setpoint change.

Optimizes Disturbance Rejection

Because the IFLC has little overshoot, it can use large control gain to reject disturbances without increasing its overshoot. This advantage enables the IFLC to provide the most desirable setpoint response and disturbance rejection possible.
Product Requirements

The Intelligent Fuzzy Logic Control product requires:

- PROVUE or Operator Workplace (OWP) console software
- Type SW3151 ENVOX configuration software
- Type ACS401 Intelligent Tuner software

Specifications

<table>
<thead>
<tr>
<th>Computer Requirements</th>
<th>Controller Requirements</th>
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<tbody>
<tr>
<td>DEC VAX/VMS operating system with VMS 5.4-2 or later</td>
<td>PROVOX 20-Series or 20-Series SR90-controller (IFC or UOC)</td>
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<tr>
<td>Hard Disk Requirements</td>
<td>Controller Requirements</td>
</tr>
<tr>
<td>1 Mbyte of disk space (2000 blocks)</td>
<td>Required: 2 DCD points</td>
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<tr>
<td></td>
<td>2 AO points</td>
</tr>
<tr>
<td>PROVOX Software Requirements</td>
<td>1 LCP (interface)</td>
</tr>
<tr>
<td>Type SW3151 ENVOX Configuration Software P2.0 or later and Type ACS401 Intelligent Tuner software version P1.0 or later</td>
<td>1 LCP (+1 per additional fuzzy controller)</td>
</tr>
<tr>
<td>Console Requirements</td>
<td>Controller Loading</td>
</tr>
<tr>
<td>PROVUE Console software version P5.0 or later or OWP console software version P1.1 or later</td>
<td>A function of the number of fuzzy controllers installed and scan rate settings. Less than 1% CPU load per fuzzy controller at a 1-second scan rate.</td>
</tr>
<tr>
<td>IFLC Console Displays</td>
<td>Optional: 1 Help display</td>
</tr>
<tr>
<td>One custom display</td>
<td>2 Faceplate displays</td>
</tr>
<tr>
<td>Additional: 1 Help display</td>
<td>2 Faceplate displays</td>
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Ordering Information

The IFLC is licensed on a device basis (20-Series or 20-Series SR90 controller). As many as 16 fuzzy logic controllers can be created per installation of the software. A single “right to copy” certificate allows multiple copies of the product to be installed on the same physical controller (IFC/UOC).

When ordering, specify —

TYPE ACS201 INTELLIGENT FUZZY LOGIC CONTROL

- One “right to copy,” one IFLC software medium (TK50 tape), and one set of user documentation
- Additional “rights to copy”
- Additional sets of user documentation
While this information is presented in good faith and believed to be accurate, Fisher-Rosemount Systems, Inc. does not guarantee satisfactory results from reliance upon such information. Nothing contained herein is to be construed as a warranty or guarantee, expressed or implied, regarding the performance, merchantability, fitness or any other matter with respect to the products, nor as a recommendation to use any product or process in conflict with any patent. Fisher-Rosemount Systems, Inc. reserves the right, without notice, to alter or improve the designs or specifications of the products described herein.