



## Customer Profile

Ismeca is the world's top supplier of semiconductor tape and reel automation systems for the electronics industry. Ismeca's customers include many of the largest automotive and electronics companies.

### Application

- Capacitor Testing and Labeling

### Industry

- Assembly and Processing  
Equipment Manufacturing

### Location and Web Site

- Vista, California
- [www.ismeca.com](http://www.ismeca.com)

### Key Benefits

- No custom I/O drivers required
- Programming efficiency
- Superior value
- HMI screens for system end-users

### Mission-Critical Capability

- Programming effort cut from two months to two weeks

**"...now that we've seen its speed, 3-4 ms scan times, we can use Live! in future versions of our faster machines."**

*Alberto Gilli  
Software Engineering Manager  
Ismeca*

# Custom Capacitor Testing Machine uses PC for Control

**A**fter nearly two years of planning and research, Ismeca chose PC-based control using Entivity Live! software for their new, automated component testing machines. It all began when a major capacitor manufacturer needed an automated test station, and called on Ismeca.

## Ismeca Makes the Grade

Alberto Gilli, a software engineering manager at Ismeca, oversees the research and development of new machines. Existing products did not test components, so this was a custom project. Gilli describes the problem: "The capacitors are of the high-capacity type (called ultra-capacitors), used to store energy for computer memory chips. They needed a machine to automatically test and grade each capacitor into premium, standard, and defective categories. The capacitance value isn't the issue; the grading is based on internal resistance." An ultra-capacitor is sensitive to internal resistance, since a self-discharge would cause data loss in a typical application.

Capacitor testing is just one of several tasks the machine had to perform. The machine would have a total of eight stations for testing. Gilli explains, "The capacitors enter a bar-coded tray. The machine reads the bar code and removes the caps from the tray. Then the time and bar code are printed on each cap, using an ink jet printer. The first station is the electrical test. We use an HP ICR (inductance-capacitance-resistance) meter with a GPIB interface. Then we graph the result on the operator screen, and use it for grading the capacitor. Then it goes through a discharge station that applies a resistance across the leads. Finally, the last station snips the leads to length."

## Control Strategy Leads to Entivity

The engineering team at Ismeca is accustomed to solving high-speed

assembly problems. Some of their tape and reel machines process 6,000 to 12,000 electronic parts an hour — that's one part every 300 milliseconds! These machines traditionally used dedicated controllers with custom software in C++ and Visual BASIC for operator screens. By comparison, the new capacitor testing machine could work at a leisurely pace of one part every 3 seconds (the electrical test performed on each capacitor imposed a settling time to acquire accurate readings).



Ismeca's new capacitor testing machine — note entry and exit conveyors at left, LCR test instruments at top, and HMI at right.



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## Customer Satisfaction

**The project development time was favorable, as Gilli recalls: "This was a custom machine and the first (of its type) for us. For the PC platform we had, we calculated about two months to get the software controlling the I/O card. Live! has a very good COM/OPC interface that allowed us to get it working in just two weeks."**



Ismeca's new capacitor testing machine — note the eight pick-and-place stations.

Ismeca engineers installed Entivity Live! software on a desktop PC running Windows NT. "We had a lot of I/O hardware that we wanted to keep using," Gilli explains. "It includes an I/O card from Contec and a Galil motion card. We also have a GPIB interface that talks to the HP ICR test instrument." Ismeca's high-speed assembly machines can't use standard factory I/O with typical transition delay times of 5 to 15 ms. Instead, using

I/O cards from Contec Microelectronics produces only 300 nanosecond delays.

PC-based control software is often marketed with factory I/O hardware, as vendors compete with PLCs at the solution level. But the Live! software interfaces many factory I/O subsystems, as well as I/O devices used in laboratory and high-speed assembly applications. Gilli remarks, "Live has the most complete set of I/O drivers, so we didn't have to create a single one."

### **Faster Development, Powerful Tools**

The capacitor testing application was Ismeca's first to use Live! software. But Gilli notes, "We've always done flowcharts for project documentation, so we were comfortable with them. The language itself is well done, because there are relatively few instructions for the programming power

you have. For example, the MOVE instruction often does what would usually require four or five instructions because it can automatically convert the data format during a move. We also used subcharts quite a bit, because the local variable support is good."

The heart of the machine uses an eight-station pick-and-place mechanism. The capacitors step through the stations. Flowchart logic mirrors the capacitors' journey with a data array, overwriting the array for each increment. With the moves at

three-second intervals, the journey from entry to exit for a capacitor takes about a minute.

The machine's bar code printer required a serial interface from the PC. Says Gilli, "The serial communication was really easy, especially compared to how PLCs have to handle it." The string tagname is one of the data types in Live!. String tagnames can be mapped directly to the communication port's buffers for virtually transparent use. A Communications flowchart block handles transfers by referencing string tags.

### **Test Driving the Tester**

Ismeca's team fine-tunes their CPUs in hot pursuit of the lowest possible scan time. Although the initial scan time was only about six milliseconds, Gilli notes: "We upgraded the PC to use a SCSI drive in order to get a little faster scan time." While the use of SCSI is optional, Gilli is proud of the result: "We're getting a scan time of about four milliseconds," he says, "and that's really amazing when you consider we're doing that with a \$2000 off-the-shelf PC." Once installed at the end customer's site, the test machine will log measurements to a file and the file will be transmitted to a host computer via an Ethernet connection.

### **Future Machines with Entivity**

Gilli sums up his Live! project experience: "One of the biggest things in their favor is the quality of the field support. And now that we have seen its speed — 3-4 ms scan times, we can use Live! software in future versions of our faster machines."