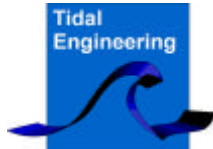




A White Paper: Environmental Chamber Controls Meet the 21st Century



Prepared by



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Introduction

With the explosive growth in the electronics marketplace and the realization of a global economy the pace of change in electronics is rapidly becoming difficult to manage; product development cycles are becoming compressed in time. In addition, quality in design and manufacture is becoming critically important to the success of any new product or system.

Today, environmental testing procedures, including burn-in, temperature/humidity cycling, thermal shock, altitude, vibration, vacuum, ESS, and other environmental tests, play an important role in various stages of design and manufacture. This helps ensure that a quality product reaches the end customer.

The environmental chamber is the tool that is key to this process. When the United States became involved in World War II, the government called upon Tenney's expertise to manufacture test chambers that simulated specific temperature, humidity, and pressure environments. Thus, the test industry was established, and Tenney was a pioneer.

Tenney again is a pioneer with its latest environmental chamber controller, the VersaTenn V. This white paper discusses the significant advantages the VersaTenn V provides to the modern global enterprise.

This new controller incorporates capabilities that can take environmental testing into the 21st century. The controller includes communication capabilities for the modern "Connected Factory". The "Connected Factory" is a global enterprise where data is gathered from around the world via the Internet through the World-Wide-Web, from around the factory floor via Ethernet, and from around the test lab via the IEEE 488, RS-485 and RS-232 interfaces.

In the following sections we will discuss the features of the new Tenney VersaTenn V (VT V) specifically designed to minimize downtime, to support global deployment and to support the testing process outside the scope of simply controlling the chamber.

Getting Connected over the Web

With Ethernet's reign extending from the office environment to factory floor it is important to be able to connect to it seamlessly. The VT V controller includes the 10/100 BaseT Ethernet capability to do this. Using the Microsoft Windows CE operating system, the environmental chamber is a plug and play network device.

The VT V connects to a LAN using a static IP address or using the DHCP protocol. It also offers a built-in web server using Tidal Engineering's WebTouch™ Remote (pat pending) technology. This technology provides a web browser user interface that is identical to the local touch screen interface on the environmental chamber (See Figure 1 VersaTenn V Browser View).

In today's Internet environment, network security is critical so the VT V web server requires a username and password that is managed from the touch screen.

The VT V offers a full complement of communications options. In addition to Ethernet (with a Web Server), the VT V offers serial (RS-232 and RS-485) and IEEE 488 interfaces. These media support testing in multiple environments such as test and measurement, factory automation and process control.

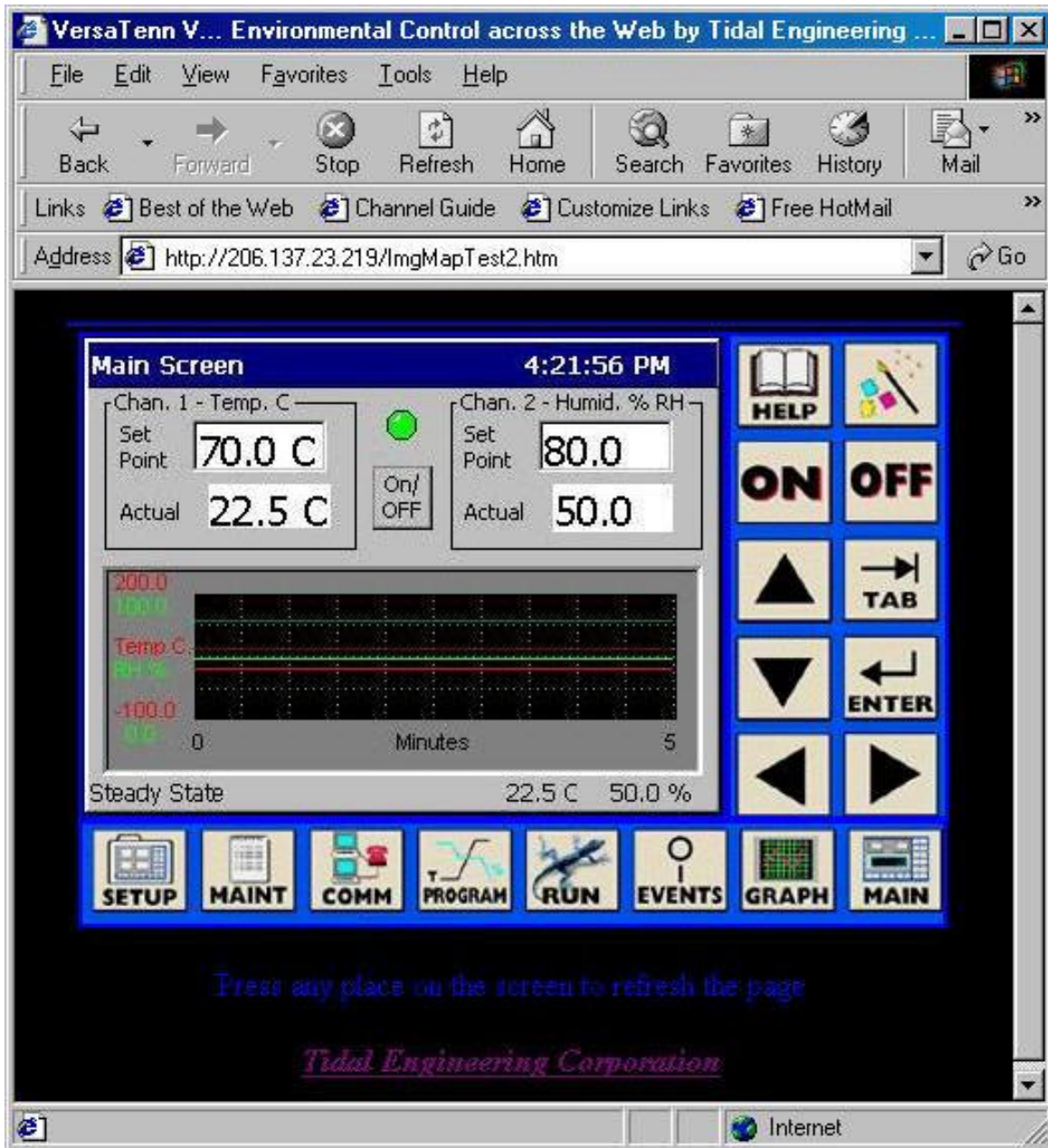


Figure 1 VersaTenn V Browser View

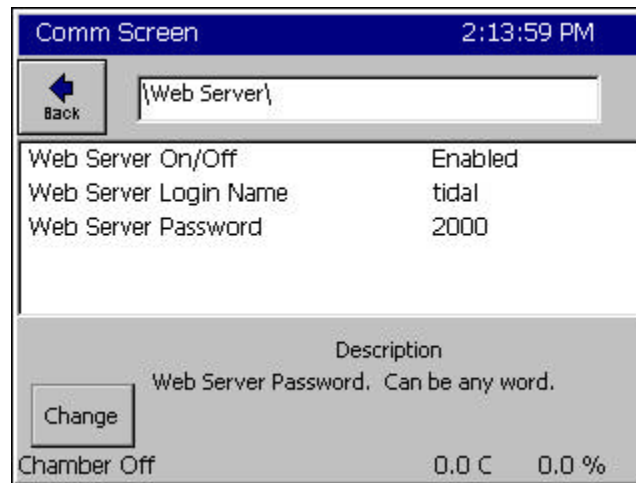


Figure 2 Web Server Setup Screen

The VT V also accepts commands via telnet so factory engineers can connect to their chamber with the Tenney LinkTenn32 Client. In addition, test and manufacturing engineers can create their own test applications using the Winsock API (Application Programming Interface) in LabView, Visual Basic, or Visual C++. The advantages of remote access are many. A few of specific advantages of the VT V are:

- **Remote Monitoring**
Environmental test labs can provide their clients with remote chamber monitoring. Test engineers can view chamber status from home using a web browser.
- **Remote Troubleshooting reduces down time**
With remote access over the Internet, Tenney factory personnel can troubleshoot chamber problems, without the expense or delay of a field service call.
- **On-line training support**
Technical support personnel can provide on-line training support to customers by assisting personnel over the telephone while viewing and/or controlling the touch screen remotely.

Tenney LinkTenn32, a Powerful Tool for the Test Engineer

The VT V connects over these communications media to a powerful desktop client application called LinkTenn32. This application offers:

- **Multi-chamber Support**
The LinkTenn32 supports multi-chamber control and monitoring.
- **Data graphing and manipulation**
Chamber setpoints, process variables, Unit-Under-Test (UUT) temperature sensors, and diagnostic readings can be graphed, exported and manipulated.

- **Program management and creation**

Environmental profiles can be created, edited, downloaded and executed from the desktop application.

Open and Compatible

The VT V is compliant with open standards for file systems, Ethernet, Internet and Windows networking. VT V Floppy disks are compatible with both DOS and Windows. The networking features of the VT V are compatible with other Windows operating systems and the Internet. Now the test/production engineer is more efficient. Not only can she use her computer to exchange information with the VT V via floppies but now she can also connect to the environmental chamber through her local area network.

User Friendly

With modern manufacturing methods and organizations, it is advantageous to be able to have personnel trained across multiple jobs and processes. With global organizations and the incorporation of multi-cultural personnel in the manufacturing process multiple languages are commonly used within one organization.

The VT V answers these and other user interface issues with a strong positive reply. The following sections provide examples of:

- Advanced User Interface with Softkeys and Navigation Buttons.
- Familiar Windows graphical user interface.
- Context-sensitive help in multiple languages.
- Powerful VT Wizards provide straightforward step-by-step procedures for various processes.

The eight Softkeys at the bottom of the touch screen (See Figure 3) are the essential roadmaps to total system control. With the touch of the finger the operator can quickly switch between screens and access programming, setup, and diagnostic information, providing total chamber control. Navigation and control buttons on every screen permit instant access to chamber functions and options.

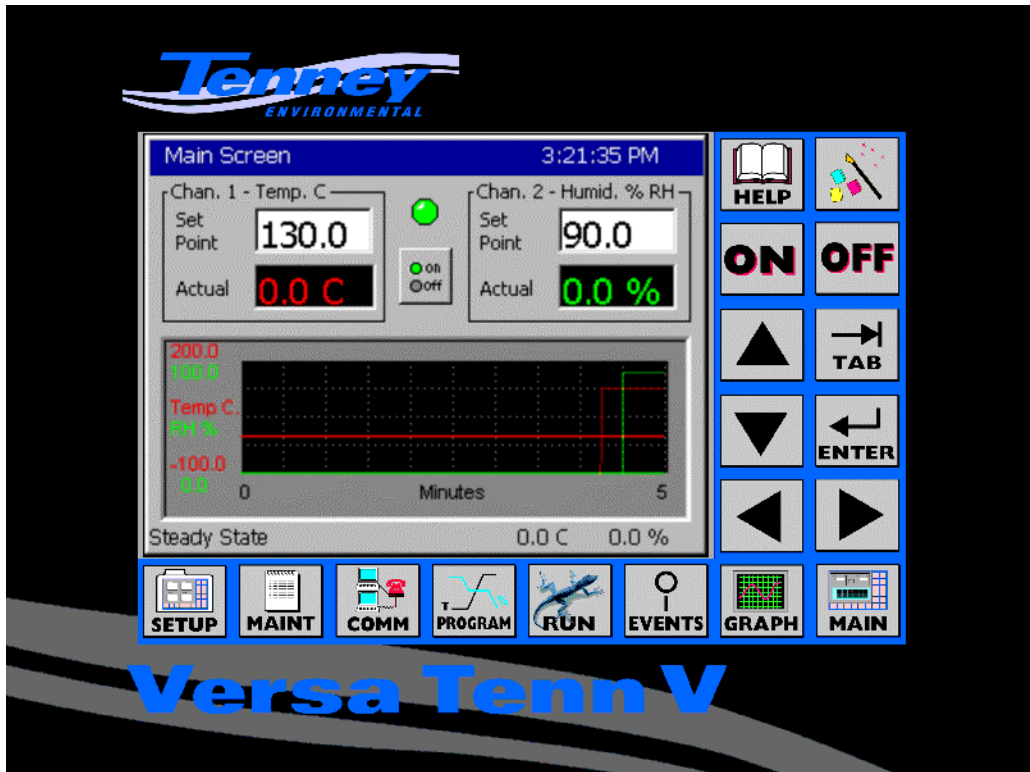


Figure 3 VersaTenn V Touch Screen

The color LCD is used to advantage on the mini-graph on the MAIN screen. A full sized graph is available on the GRAPH screen. Process and setpoint variables are shown in consistent colors for easy recognition.

- **Familiar Windows User Interface**

The VT V controller uses the familiar Windows user interface. Driven by Windows CE, with a color LCD touch screen, the VT V capitalizes on the ubiquity of the Microsoft Windows operating system to make the system extremely easy to operate. The following screen-shots provide examples of the user interface.

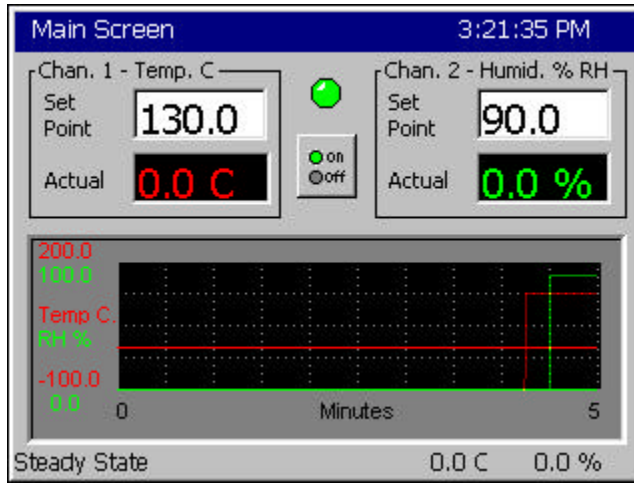


Figure 4 Main Screen with Graph

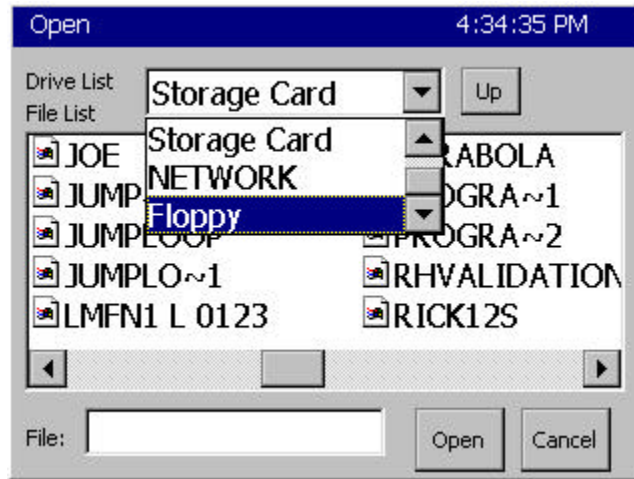


Figure 5 Open File Dialog

Figure 6 Example VersaTenn V Screens

| | |
|--|--|
| | <p>Run Screen - Program Status</p> <p>The graphic icons provide a familiar Run/Stop/Pause interface. This running program is displayed in the title bar at the top of the screen. The current step is highlighted in the list of program steps as the program executes. The Actual and Setpoint values for both temperature and humidity are displayed above the list box. The time remaining in the current step is at the bottom.</p> |
| | <p>Communications Options</p> <p>This screen shows the five communications options of the VersaTenn V. By touching a specific folder, settings for that option are displayed and can be changed.</p> |
| | <p>Program Screen</p> <p>The Program Screen is used to create, edit, save and recall programs. Graphic icons improve the usability of the interface. Wizards for adding and editing program steps are available from this screen. Program files are saved and loaded from this screen.</p> |

- **Context-sensitive Help**

The controller offers on-screen context sensitive help. Help for each button, icon, textbox, etc. is available on-line.



Figure 7 Context Sensitive Help

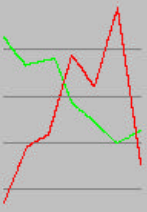

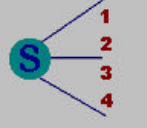
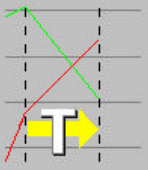

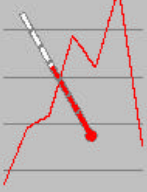
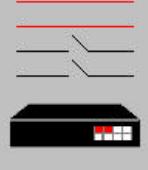



Figure 8 Context Sensitive Help (Spanish)

- **VT V Wizards**

The VT V wizards provide simple step-by-step instructions for user processes including program creation, program editing and other procedures. These wizards guide the user, in his native language, through each step of the process. The screen-shots below provide an example of the power of the step-by-step procedures available through the VT Wizards.

Figure 9 VersaTenn V Wizards

| | | | | | | | | | | | | | | | | |
|---|---|-----|-----|--------|---|-------|---|---|---|---|--------|---|---|---|---|--------|
| <p>Step 1</p> <p>Add Step Wizard 4:06:35 PM</p>  <p>This wizard will guide you through adding a new step to the current program. Press Next to continue.</p> <p>Tenney <- Back Next -> Cancel</p> | <p>Step 5</p> <p>Add Step Wizard 6:08:57 PM</p>  <p>The controller can ramp the chamber setpoints to the programmed level in a specified time or jump to the setpoint immediately. Select which you would like, and click Next to continue.</p> <p><input checked="" type="radio"/> Specify a ramp time <input type="radio"/> Jump to setpoint</p> <p>Tenney <- Back Next -> Cancel</p> | | | | | | | | | | | | | | | |
| <p>Step 2</p> <p>Add Step Wizard 4:07:43 PM</p>  <p>Select "Add a Step" to append the new step to the end of the program else select "Insert Step" to specify where to add the step. Then press Next to continue.</p> <p><input checked="" type="radio"/> Add a Step <input type="radio"/> Insert a Step</p> <p>Tenney <- Back Next -> Cancel</p> | <p>Step 6</p> <p>Add Step Wizard 6:10:02 PM</p>  <p>Enter the ramp time in Hours, Minutes and Seconds in the boxes below. Click a box to open the number pad to edit values then click Next to continue.</p> <table border="1"><tr><td>Hr</td><td>Min</td><td>Sec</td></tr><tr><td>0</td><td>32</td><td>4</td></tr></table> <p>Tenney <- Back Next -> Cancel</p> | Hr | Min | Sec | 0 | 32 | 4 | | | | | | | | | |
| Hr | Min | Sec | | | | | | | | | | | | | | |
| 0 | 32 | 4 | | | | | | | | | | | | | | |
| <p>Step 3</p> <p>Add Step Wizard 4:10:31 PM</p>  <p>Which type of step would you like to add?</p> <p><input checked="" type="radio"/> SetPoint <input type="radio"/> Jump Loop</p> <p><input type="radio"/> Wait For <input type="radio"/> Auto Start</p> <p><input type="radio"/> Stop <input type="radio"/> Link</p> <p>Click on Help and click any item above for more information</p> <p>Tenney <- Back Next -> Cancel</p> | <p>Step 7</p> <p>Add Step Wizard 6:10:42 PM</p> <p>Setpoint Ramp Seconds</p> <p>Valid Range: 0 to 59 Seconds</p> <p>Present Value 4</p> <p>New Value <input type="text" value="23"/></p> <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>Clear</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>Cancel</td></tr><tr><td>9</td><td>0</td><td>.</td><td>-</td><td>Accept</td></tr></table> | 1 | 2 | 3 | 4 | Clear | 5 | 6 | 7 | 8 | Cancel | 9 | 0 | . | - | Accept |
| 1 | 2 | 3 | 4 | Clear | | | | | | | | | | | | |
| 5 | 6 | 7 | 8 | Cancel | | | | | | | | | | | | |
| 9 | 0 | . | - | Accept | | | | | | | | | | | | |
| <p>Step 4</p> <p>Add Step Wizard 4:11:13 PM</p>  <p>Do you want to control the temperature this step?</p> <p><input checked="" type="radio"/> Control <input type="radio"/> Don't Control</p> <p>What temperature do you want? Click the box below for a number pad.</p> <p><input type="text" value="0"/></p> <p>Tenney <- Back Next -> Cancel</p> | <p>Step 8</p> <p>Add Step Wizard 4:17:46 PM</p>  <p>This screen allows you to turn on and off external outputs. Check any outputs that you want on.</p> <p><input checked="" type="checkbox"/> Event 1 <input type="checkbox"/> Event 4</p> <p><input checked="" type="checkbox"/> Event 2 <input type="checkbox"/> Event 5</p> <p><input checked="" type="checkbox"/> Event 3 <input type="checkbox"/> Event 6</p> <p>Tenney <- Back Next -> Cancel</p> | | | | | | | | | | | | | | | |

| | |
|---|---|
| <p>Step 9</p>  | <p>Add a Step Wizard</p> <p>That is all that it takes to create a new program step. Editing a program step is just as easy, the wizard is the same but the current program settings are pre-initialized.</p> |
|---|---|

VT V Includes a Powerful Data Acquisition System

The VT V offers a built in data acquisition system (See Figure 10) that compliments the chambers capabilities and can be used to create a complete test system. Up to 64 thermocouple sensors can be monitored and logged for analysis. This feature is especially useful when engineers need to:

- Measure multiple chamber temperature gradients.
- Record UUT temperatures during environmental testing.
- Troubleshoot chamber problems.

Data Logging

Data can be logged over time for test reports, record keeping, troubleshooting and preventive maintenance. The sample rate is programmable and the data is stored on a solid state Flash disk in comma delimited format for easy export and manipulation. The following data sets are available for logging:

- Process setpoints (i.e. Temperature, humidity setpoints)
- Process variables (i.e. Temperature, humidity, etc)
- Diagnostic parameters (Compressor pressures and temperatures)
- UUT Data acquisition (up to 64 temperatures)
- Control Variables (% Heat, % Cool, % humidify, etc.)

Conclusion

The New VersaTenn V from Tenney Environmental has the capabilities to address the environmental testing needs of the "Connected Factory"; an important part of the modern global enterprise. The features discussed above, including connectivity, usability and compatibility make the VT V a powerful tool for any organization, today and in the future.

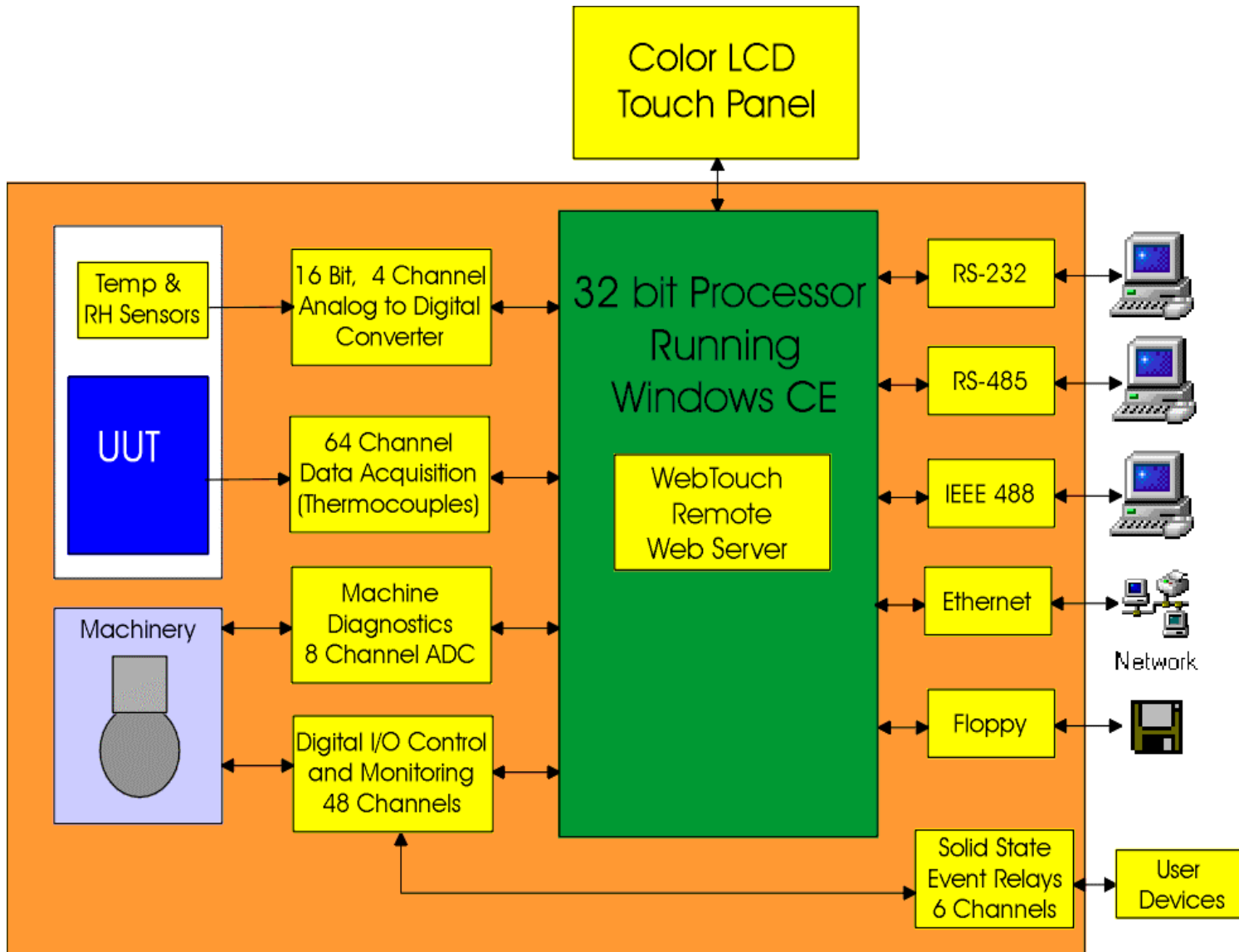


Figure 10 Tenney Environmental Chamber with New VersaTenn V Controller

About Tenney

Few manufacturers of environmental simulation equipment can match the history and diversity of Tenney. Since its founding in 1932, Tenney has instinctively been a vanguard of innovation, supplying its customers with the latest effective and efficient technology to meet the changing demands of its customers. Tenney has established a reputation as a full-service provider.

Tenney's product line includes chambers for burn-in, temperature/humidity cycling, thermal shock, vacuum, thermal vacuum, altitude, ESS, and vibration.

Tenney is a Division of Lunaire Limited, A United Dominion Company and is located at 4 Quality Street, Williamsport, PA 17701.

Tel: 570-326-1770 Fax: 570-326-7304

For more information about Tenney, visit the company's Internet homepage at www.Tenney.com.

About Tidal Engineering

Tidal Engineering developed the VersaTenn V environmental chamber controller and is supplying it to Tenney under contract. Since 1994, Tidal Engineering has been designing and building embedded hardware and software for test and measurement, and data acquisition applications. In addition, Tidal's contract engineering service offers alternatives for OEM's who desire to strengthen their product development capacity.

Tidal products, like the MT488A Mini Tester, the SBC488 Single Board Computer, and MT488A-RC remote controlled IEEE 488 solution, are used by major corporations in several market segments, and have been recognized by industry for their innovation.

Tidal Engineering products are available exclusively from:

ADI American Distributors Inc., Two Emery Avenue Randolph, NJ 07869

Tel: 973-328-1181 Fax: 973-328-2302. For more information about Tidal Engineering, visit the company's Internet homepage at

www.TidalEngineering.com.