

## Correlation of Voltage and Temperature Measurement

MEASURpoint™ is an ultra-accurate instrument for any combination of temperature and voltage to be measured with a single software solution. Each MEASURpoint allows up to six eight-channel thermocouple, RTD, or voltage boards in a single box, providing a total of up to 48 measurement channels. MEASURpoint is available as a USB or Ethernet (LXI™ Class C compliant) instrument.

MEASURpoint includes the Measurement Application to configure and acquire temperature, resistance, and voltage channels, display, log, analyze, and export data to other formats including Excel. A ready-to-measure program for immediate productivity.

Correlation of voltage and temperature measurements is an important requirement for many applications:

- Li-ion cell measurement
- Hybrid electric vehicle battery performance
- Fuel cells
- Thermal management for battery/motor systems

### Key Design Features:

- ISO-Channel™ technology provides 1,000V galvanic isolation channel-to-channel and to the host computer to protect signal integrity
- Ethernet (LXI™ Class C compliant) or USB
- Configure up to 48 channels in groups of 8 channels per board
- Dedicated 24-bit, Delta-Sigma A/D converter for each thermocouple, RTD, or voltage channel operating in parallel
- 10Hz throughput rate on each channel simultaneously or 480Hz for 48 channels
- DC/DC converter per channel maximizes isolation
- Easy-access jacks for quick wiring thermocouple inputs and screw terminals for RTDs and voltage inputs
- Measurement Instrument Field Calibration Utility... Comprehensive procedure assures accurate measurements at all times
- Measurement Application included... configure, acquire, and display data immediately

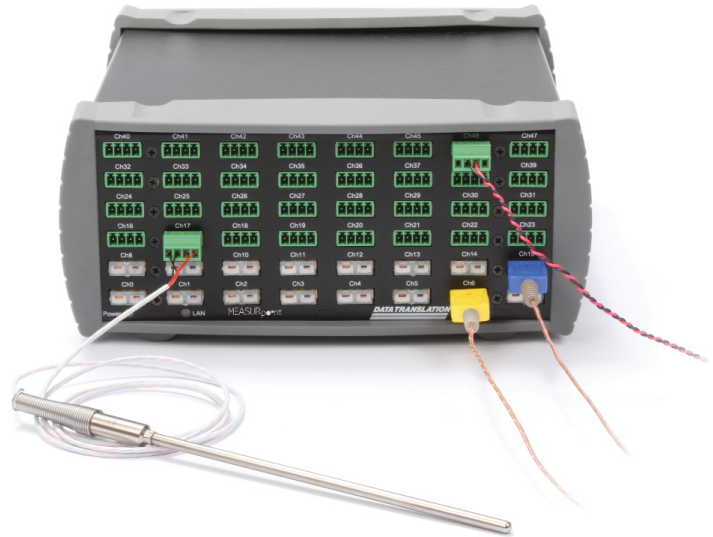
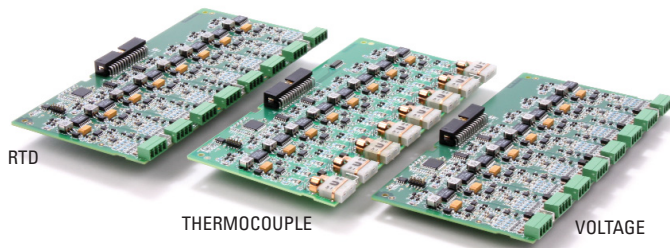


Figure 1. MEASURpoint incorporates proprietary ISO-Channel™ technology that makes measurements almost indestructible and eliminates any common mode noise and ground loop problems under all environmental conditions. In addition, up to forty-eight configurable input channels in groupings of eight voltage, thermocouple, and RTD inputs offer ultimate flexibility to the user.



Figure 2. Harsh industrial environments utilize MEASURpoint, packaged in rugged NEMA enclosures or in a rack-mount chassis.



The RTD input channels provide a 4-wire RTD input with Kelvin sensing for maximum accuracy by eliminating errors due to wire resistance. You can attach a voltage input or any of the following RTD types to these channels in a mix and match fashion: Platinum 100 Ω (Pt100), Platinum 500 Ω (Pt500), or Platinum 1000 Ω (Pt1000) RTD using an European alpha curve of 0.00385 or an American alpha curve of 0.00392. The supported temperature measurement range for these RTD types is  $-200^{\circ}\text{C}$  ( $-328^{\circ}\text{F}$ ) to  $850^{\circ}\text{C}$  ( $1562^{\circ}\text{F}$ ). You can also measure a resistance value, in Ohms, if desired.

### Thermocouple Board:

- Typical  $0.0004^{\circ}\text{C}$  resolution
- Up to  $\pm 0.15^{\circ}\text{C}$  accuracy including all errors
- B, E, J, K, N, R, S, and T thermocouple types supported
- +10 nA break-detection circuitry to detect open thermocouple inputs
- Dedicated CJC (cold junction compensation) input for each thermocouple channel

### RTD Board:

- Precision reference current source for each RTD channel
- Supports Platinum RTD types: Pt 100 ( $\pm 0.07^{\circ}\text{C}$  accuracy), Pt500 ( $\pm 0.01^{\circ}\text{C}$  accuracy), Pt1000 ( $\pm 0.01^{\circ}\text{C}$  accuracy)

### Voltage Board:

- 3 software selectable input ranges:  $\pm 10\text{V}$ ,  $\pm 100\text{V}$ ,  $\pm 400\text{V}$  on a per channel basis
- Maximum  $300\mu\text{V}$  error for  $\pm 10\text{V}$  input range,  $2\text{mV}$  error for  $\pm 100\text{V}$  input range, and  $\pm 8\text{mV}$  error for  $\pm 400\text{V}$  input range

The precision high voltage analog input channels allow direct connection of voltages with three software selectable input ranges:  $\pm 10\text{V}$ ,  $\pm 100\text{V}$ , and  $\pm 400\text{V}$ .

## A CJC Circuit on Every Channel

Thermocouples are "relative" not "absolute" temperature measuring devices that generate voltage as a function of the temperature difference between both ends. To measure absolute temperature, you need to know the temperature of one end of the thermocouple to find the temperature of the other end. This is where the CJC circuit comes in. The CJC measures the temperature of the end of thermocouple that plugs into the instrument. MEASURpoint incorporates an independent CJC circuit for every channel. This is a more costly approach, but makes MEASURpoint more accurate and more immune to temperature variations both inside and outside the instrument.

## Analog Input Flexibility

Each MEASURpoint instrument provides up to forty-eight configurable channels, allowing for ultimate flexibility with thermocouple, RTD, and voltage inputs. Because MEASURpoint architecture uses an A/D per channel, sampling rates of up to 10Hz per channel simultaneously, or 480Hz for all 48 channels can be achieved.

On the thermocouple channels, a voltage or thermocouple input can be attached to any channel in a mix or match fashion. The analog input range is  $\pm 75\text{mV}$ . (An optional input range of  $\pm 1.25\text{V}$  is available.) Having an independent CJC and A/D per channel allows the conversion to be done right at the CJC point to get more accurate thermocouple readings.

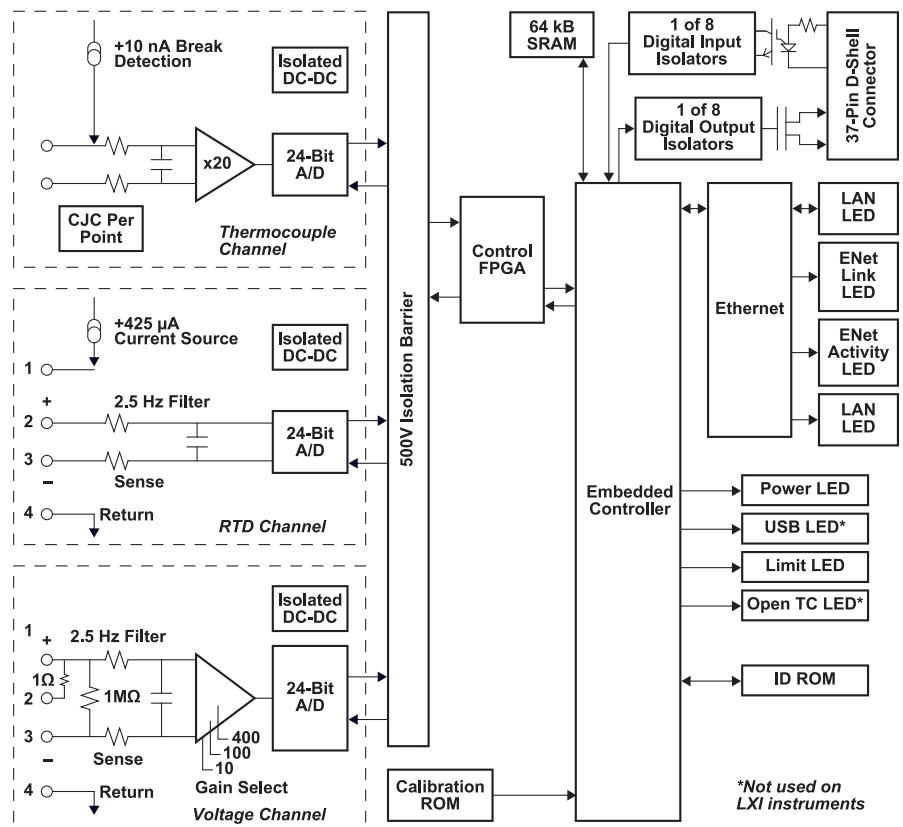


Figure 3. Block diagram.

## 1000V Galvanic Isolation with ISO-Channel™

ISO-Channel™ uses galvanic isolation methods to guarantee 1000V isolation between any input channel to any other input channel and earth ground. Common mode noise and ground loop problems are eliminated with ISO-Channel since sensors that are at different ground reference levels are easily accommodated, even if they are at widely differing voltages of hundreds of volts or transients to thousands of volts. ISO-Channel vastly increases reliability by implementing a 24-bit A/D converter per channel on each of many channels, all operating in parallel. Older system designs with relay front ends are prone to system failure through "sticking channels" or magnetic field influence. The all solid-state ISO-Channel provides digital transfer of valuable sensor data with optical or transformer isolation.

The result is that accuracy is preserved for all sensor inputs. This is especially useful when conditions change in the electrical environment due to motor current surges, electromagnetic radiation, or noisy industrial equipment turning on/off. A vast majority of thermocouple applications reside in industrial environments. ISO-Channel™ technology makes measurements almost indestructible.

## Triggers

A trigger is an event that occurs based on a specified set of conditions. Acquisition starts when the instrument detects the initial trigger event and stops when the buffer has been filled or you stop the operation. MEASURpoint instruments support a software trigger and an external trigger on digital input line 0.

## Digital Input/Output Lines

MEASURpoint instruments feature eight, isolated, digital input lines. The digital input lines operate from +3 to +28V DC, with a switching time of 2ms maximum.

MEASURpoint instruments are perfect for driving relays directly, featuring eight, isolated, digital output lines. The outputs are solid-state relays that operate at  $\pm 30V$  and 400mA peak (AC or DC) with a switching time of 2ms maximum.

MEASURpoint instruments include channel-to-channel isolation of up to 250V between digital I/O lines. If the application requires greater channel-to-channel isolation, every other digital line may be used. This reduces the number of digital I/O lines, but provides channel-to-channel isolation of 500V (one channel can be +250V while the adjacent channel can be -250V).

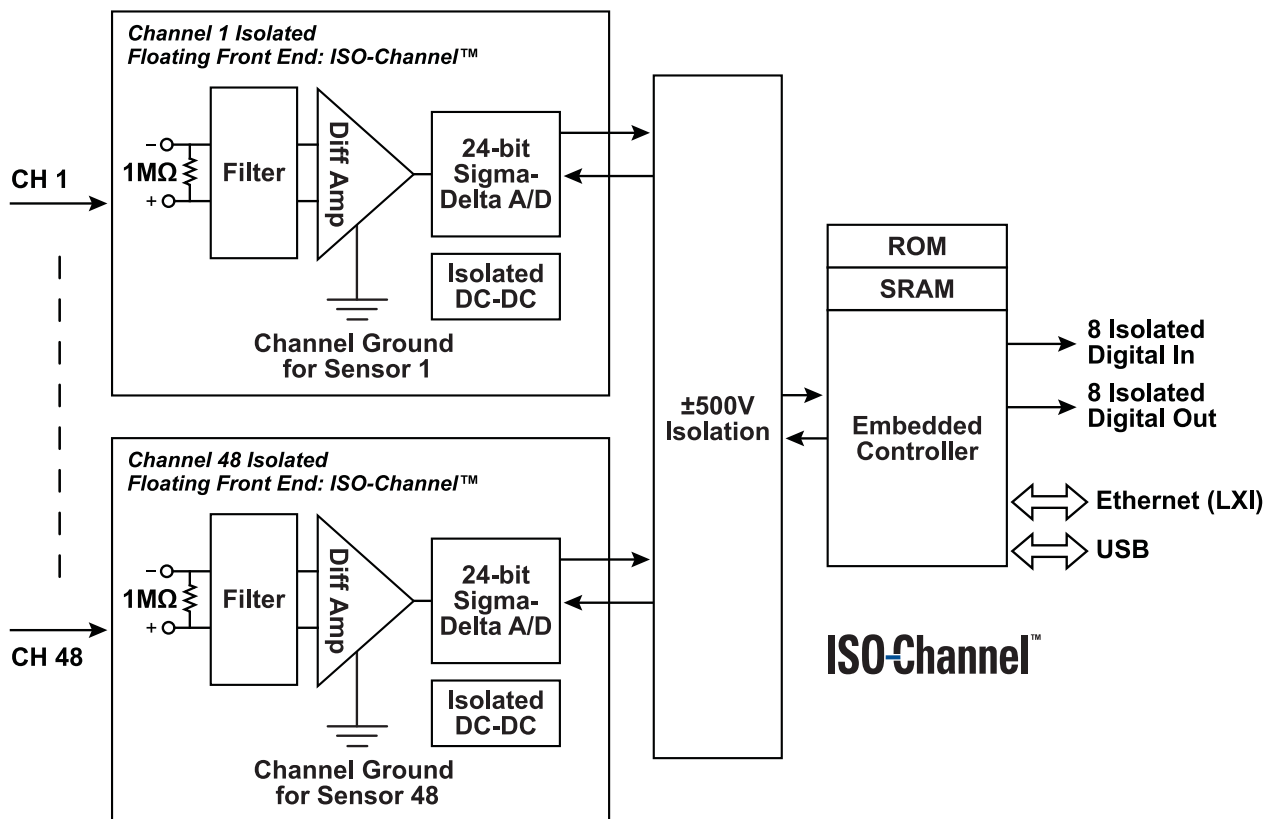


Figure 4. An A/D per channel and a DC-DC converter for each A/D provides channel-to-channel isolation, where each signal can float to its own ground reference.

## High-Stability, Low Drift Voltage References

Temperature measurement systems compare the voltages produced by a thermocouple or RTD with a known voltage before the data can be properly digitized and stored. This is where voltage references come in.

MEASURpoint uses high-precision, high-stability, low-drift voltage references rated at 4 PPM per degree and 100 PPM drift per year. This means MEASURpoint is accurate now and will remain that way over time.

## Custom Designed DC-DC Converters

Our custom DC-DC converters circuits have a unique power distribution system that supplies power to only 2 of the 6 boards at any one time. Cycling non-adjacent boards in this manner creates less power surges, reduces noise, and improves the overall system performance.

## Field Calibration

Users can calibrate any MEASURpoint instrument in the field using precise calibration equipment and the Measurement Instrument Calibration Utility. Since each MEASURpoint instrument consists of 48 individual instruments, great care must be taken to ensure that proper warm-up times are followed and precise calibration equipment is used. The Measurement Instrument Calibration Utility ships with a comprehensive help file that describes the required equipment and calibration procedure, including warm-up times, for each MEASURpoint model.

The Measurement Instrument Calibration Utility allows you to revert to the factory calibration for any or all channels, or revert back to the last user calibration values, if desired. In addition, this utility generates a report that lists the starting and ending calibration values for each channel, allowing traceability.

## Remote Measurements

The network-ready versions of MEASURpoint are LXI™ Class C compliant and provide a standard Ethernet connection to support remote monitoring and control from the field or on the factory floor. Channels can be expanded by simply adding more instruments to the network.

## Measurement Application

The Measurement Application, an executable program built with Measure Foundry®, is part of each MEASURpoint instrument. This ready-to-measure application allows you to acquire data from up to 48 thermocouple, RTD, and/or voltage channels, display the data on the screen, and log data to disk for analysis. You can be productive right out-of-the-box without writing any code. For added flexibility, you can export the data to popular applications like Microsoft Excel and The MathWorks™ MATLAB® for more advanced analysis. Using Measure Foundry, you can modify and expand the Measurement Application project file to meet your specific requirements...apply a unique algorithm or formula to your data, for example.

## Key Software Features

- Acquire temperature, resistance, and voltage data from all MEASURpoint instruments on up to 48 channels simultaneously at up to 10Hz per channel

- Configure the channel type and scan rate to suit your application
- Add alarms and min/max points for process control
- Display live signals for real-time visual analysis
- Log data to disk for analysis
- No coding necessary, just load and start measuring right out-of-the-box
- Export data into other applications for advanced post-processing and analysis
- Customize the application, if desired, using the provided project file and Measure Foundry
- Eureka Discovery Utility helps you locate or "discover" all LXI (Ethernet) instruments that are connected to your system
- Measure Foundry has a discovery component that allows LXI and USB MEASURpoint discovery in your application. You can easily display and select all available instruments, identify their IP address, as well as all instrument parameters including manufacturer, model, serial number, and operating state.

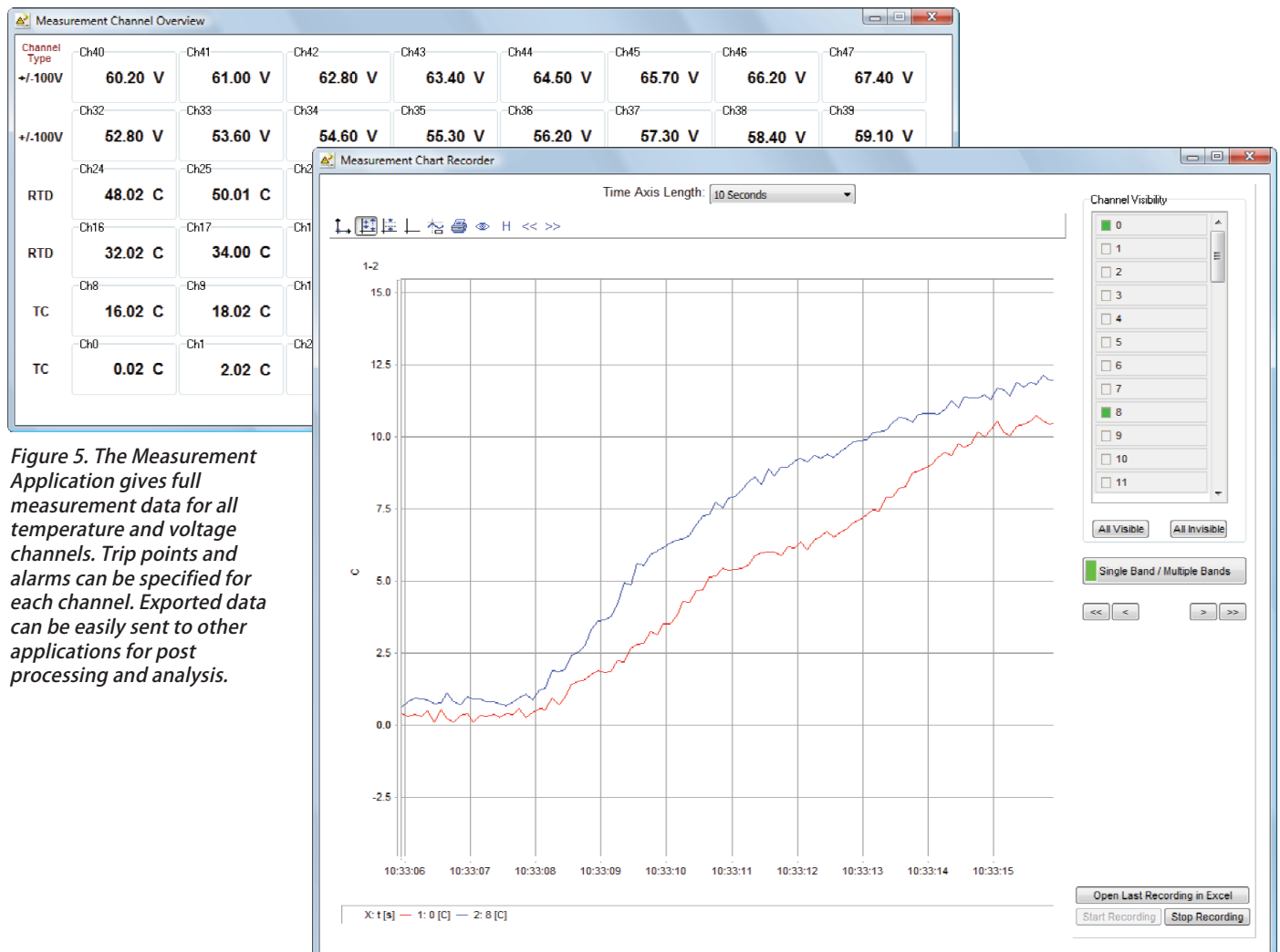


Figure 5. The Measurement Application gives full measurement data for all temperature and voltage channels. Trip points and alarms can be specified for each channel. Exported data can be easily sent to other applications for post processing and analysis.

## Additional Software Support

The following software support is available for all MEASURpoint instruments:

- **Eureka Discovery Utility** – This utility helps you locate or "discover" all LXI (Ethernet) instruments that are connected to your system and provides the following information about your instrument: the IP address, manufacturer, model number, serial number, and version of the firmware that is running on your instrument. In addition, you can use this utility to configure Windows firewall settings and update the firmware for your Data Translation LXI instrument.
- **Instrument Web Interface** – This built-in interface allows you to verify the operation of your instrument and perform basic functions with Internet Explorer and no additional software. Using it, you can configure your instrument, control output signals, measure input signals, and save results to disk.
- **Measure Foundry** – Measure Foundry® is a rapid application development package that provides a system solution for your MEASURpoint Instrument. Build complex measurement applications easily and without writing any code. Simply drag and drop components on a form and configure their property pages to access all elements of your system. The Measurement Application, an executable program included with each MEASURpoint instrument can be easily modified using this package. Measure Foundry supports all LXI instrument classes through IVI-COM. Instruments with interfaces such as GPIB, PXI/LXI, RS-232, and USB are supported through SCPI commands using the VISA transport layer.
- **IVI-COM Driver** – This driver is provided to write application programs for MEASURpoint using an IVI-COM instrument interface. It can be used with programs written in Visual C#®, Visual Basic® for .NET, or C++ under Visual Studio® 2003/2005/2008. You can also use the IVI-COM driver with LabVIEW® from National Instruments' or MATLAB® and the Instrument Control Toolbox from the MathWorks™ to program MEASURpoint instruments.
- **SCPI Commands** – Use VISA or network sockets to program and control MEASURpoint LXI instruments by sending SCPI commands. Comprehensive user manual and example programs provided.

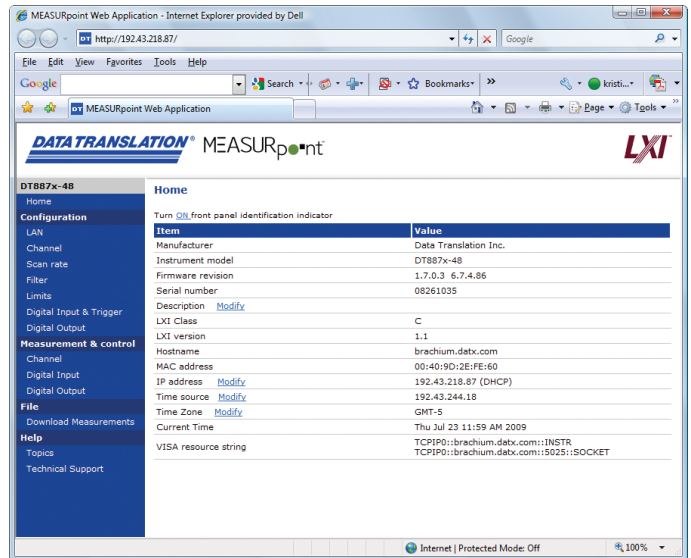


Figure 6. The main web page displays information about your instrument on the network.

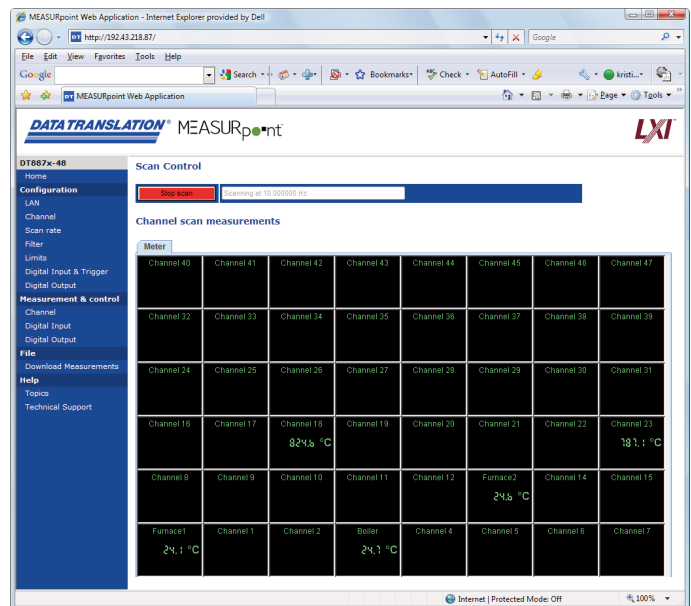
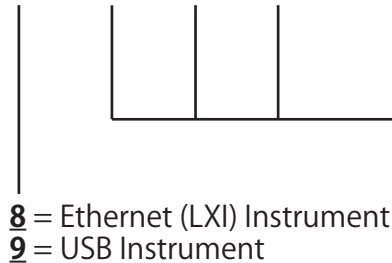


Figure 7. The Measurement and Control web pages are used to start or stop data acquisition and display live data in a numerical channel overview.

# Ordering Summary

## MEASURpoint Instrument:

**DTX874-XXT-XXR-XXV**



**T** = Thermocouple Channels  
**R** = RTD Channels  
**V** = Voltage Channels

**00** = No Channels  
**08** = 8 Channels  
**16** = 16 Channels  
**24** = 24 Channels  
**32** = 32 Channels  
**40** = 40 Channels  
**48** = 48 channels

### Ordering Example

**DT9874-16T-16R-16V**

MEASURpoint USB instrument configured with 16 thermocouple channels, 16 RTD channels, and 16 voltage channels.

If you do not find a version here to meet your requirements, please call 1-800-525-8528 or email [sales@datatranslation.com](mailto:sales@datatranslation.com) and let us know your requirements.

## Options:

- SP1309 – Measure Foundry Professional with Instrument Pak
- STP37 – Digital I/O screw terminal panel
- EP333 – Cable with two 37-pin male DSUB connectors for attaching the STP37 to the MEASURpoint instrument
- EP373 – Single Rack Mount Kit
- EP374 – Dual Rack Mount Kit

## Enclosure Options:



MEASURpoint Instruments with Rack Mount Kit.



Rugged NEMA enclosures.

For more information about MEASURpoint, please visit:  
<http://www.datatranslation.com/products/MEASURpoint/>

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