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Temperature Measurement Instruments
Ultra-Accurate . . . by Design

TEMPpoint is a family of temperature measurement instruments designed for high accuracy and industrial robustness. These instruments allow direct thermocouple, RTD, and precision voltage measurements with a PC. Available in both USB and Ethernet (LXI) versions, TEMPpoint can be configured with 8, 16, 24, 32, 40, or 48 input channels for ultimate flexibility. Your TEMPpoint instrument comes with a ready-to-measure application, allowing you to be productive immediately – temperature and voltage values can be viewed, graphed, or exported to Excel, and allow limit checking for control or monitoring of a manufacturing process.

Key Design Features:

- **Dedicated 24-bit, Delta-Sigma A/D converter for each thermocouple, voltage, or RTD channel** for simultaneous, high-resolution measurements
- **Dedicated CJC (cold junction compensation) input for each thermocouple channel**
- **1,000V galvanic isolation channel-to-channel** and to the host computer to protect signal integrity
- **Voltage Measurement:** Input range of ±75mV (±1.25V option) with ±0.01% accuracy
- **Throughput rate of up to 10Hz** for all channels... Ensures maximum accuracy with high normal mode rejection protecting against power line frequency noise
- **+100 nA break-detection circuitry** to detect open thermocouple inputs
- **TEMPpoint Field Calibration Utility...** Comprehensive procedure assures accurate measurements at all times.
- **Easy-access jacks for quick wiring** thermocouple inputs and screw terminals for RTDs
- **B, E, J, K, N, R, S, and T thermocouple types** supported; TEMPpoint automatically linearizes the measurements and returns the data as a 32-bit, floating-point temperature value
- **Digital I/O galvanically isolated to 250V**
  - **8 opto-isolated digital input lines**
  - **8 opto-isolated digital output lines;** the outputs are solid-state relays that operate from ±30 V at currents up to 400 mA (peak) AC or DC
- **Read the digital input port through the analog input data stream** for correlating analog and digital measurements

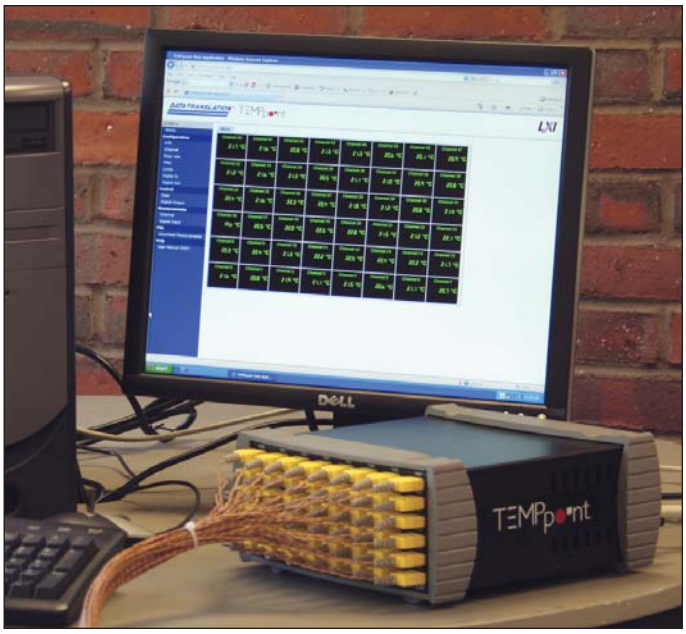


Figure 1. TEMPpoint provides highly accurate, 24-bit resolution temperature or voltage measurements on up to 48 channels. It also provides the ultimate in galvanic isolation (1,000V channel-to-channel) to protect signal integrity in harsh environments.

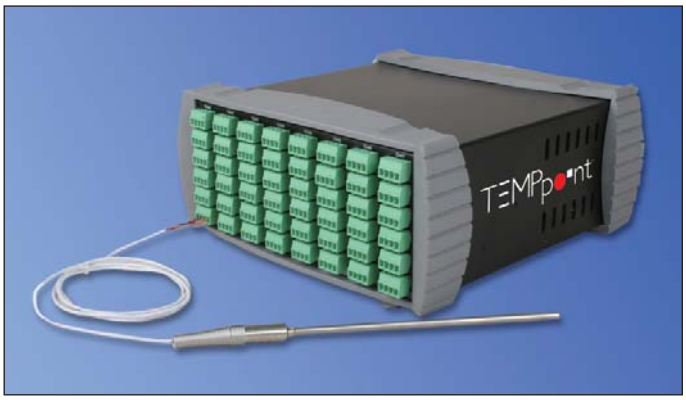


Figure 2. TEMPpoint instruments feature quick wiring with easy access jacks for thermocouple inputs on the DT9871U and DT8871U and screw terminals for RTDs on the DT9872 (shown above) and DT8872.

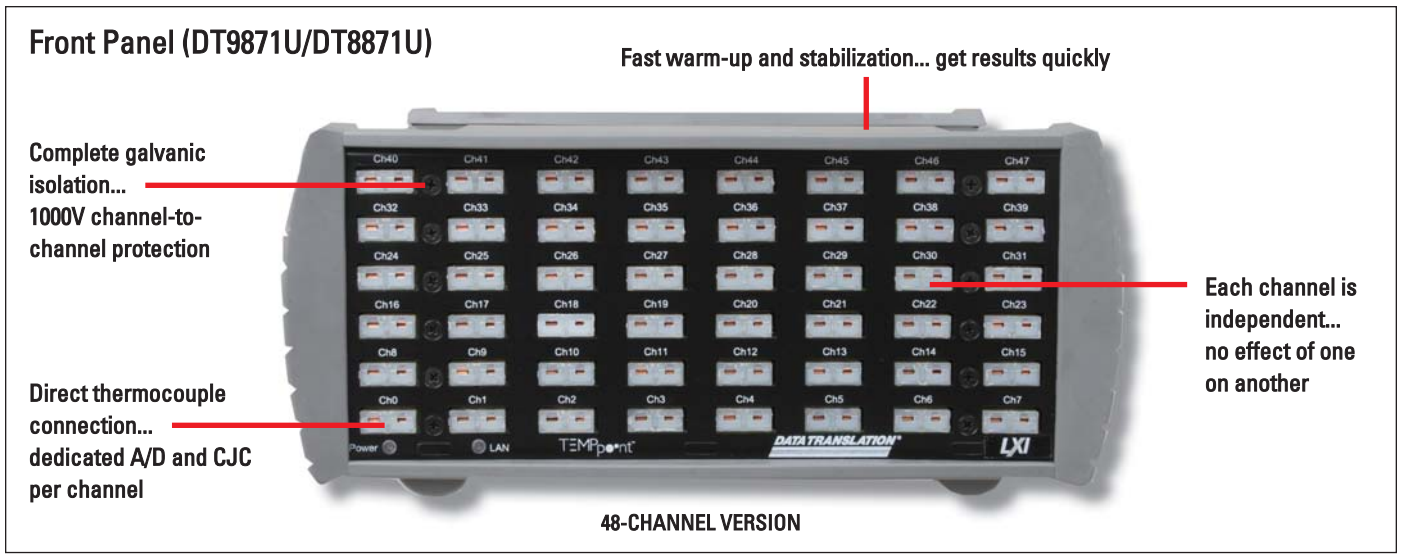


Figure 3. Every channel provides direct thermocouple or precision voltage connections as shown above.

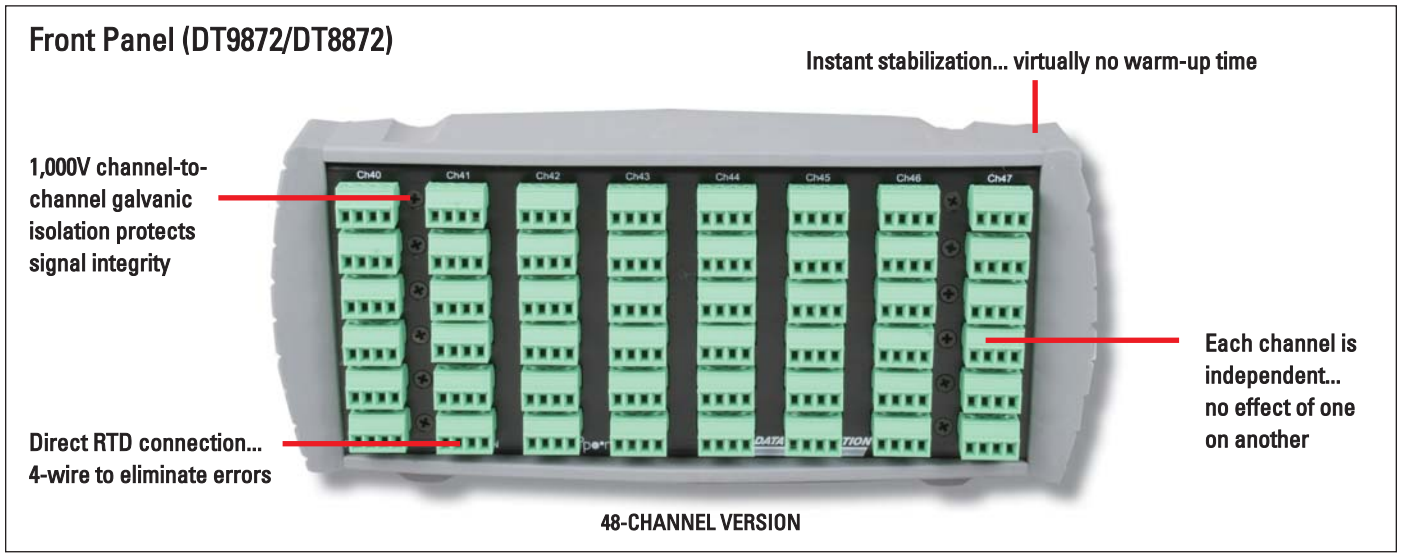


Figure 4. Every channel provides direct RTD or precision voltage connections as shown above.

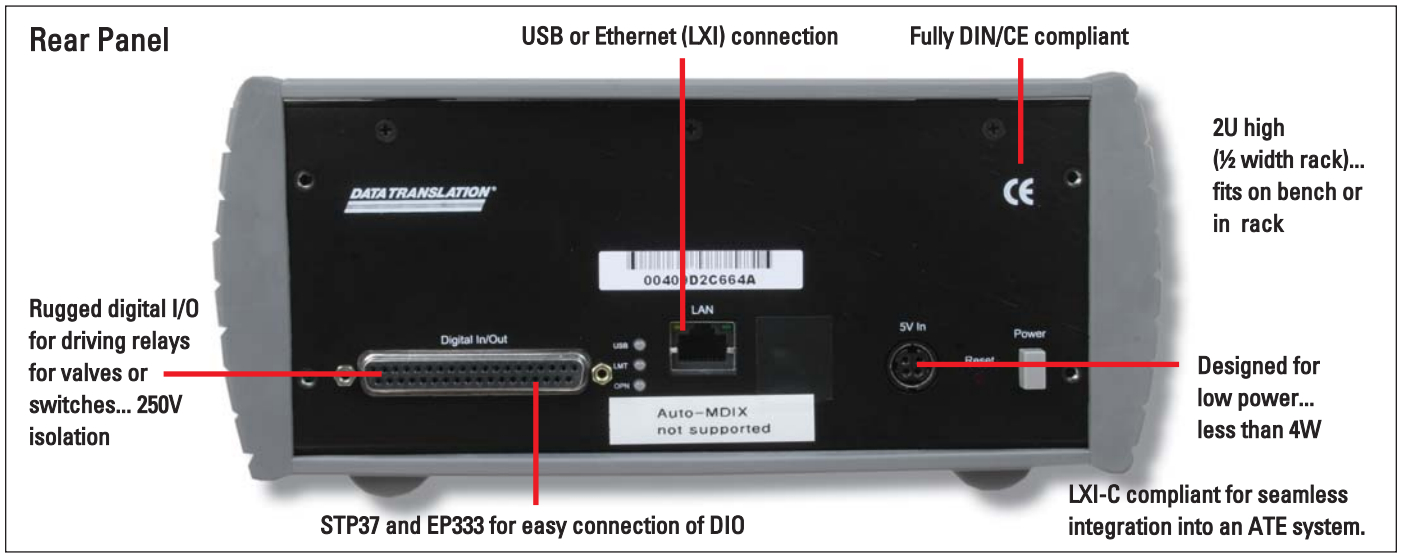


Figure 5. Digital I/O, power, and USB or Ethernet connections are provided on the back panel.

Thermocouple, Voltage, and RTD Inputs

TEMPpoint instruments support up to 48 inputs with 24-bit resolution per channel. On the DT9871U and DT8871U, a voltage or thermocouple input can be attached to any channel in a mix or match fashion. This gives the user ultimate flexibility when setting up an application.

The DT9872 and DT8872 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˚ C (–328˚ F) to 850˚ C (1562˚ F). You can also measure a resistance value, in Ohms, if desired.

The DT9871U and DT8871U provide an input range of ±75mV. (The DT9871 and DT8871 provide an input range of ±1.25V and a gain of 1.) Because TEMPpoint architecture uses an A/D per channel, sampling rates of up to 10Hz per channel over all 48 channels can be reached.

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.

Digital Input/Output Lines

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

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

TEMPpoint 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).

Triggers

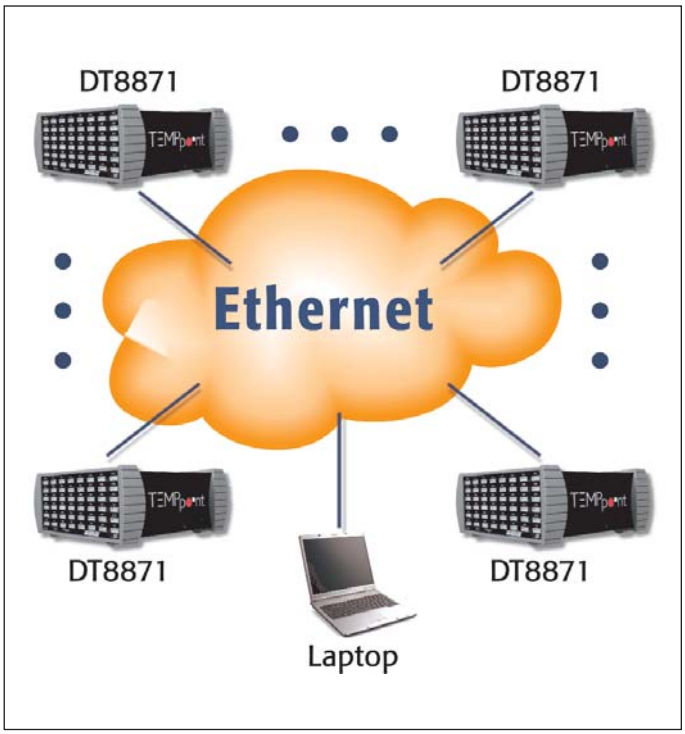
A trigger is an event that occurs based on a specified set of conditions. Acquisition starts when the instrument detects the initial trigger event and stops when either all the buffers that have been queued to the subsystem have been filled or you stop the operation. TEMPpoint instruments support a software trigger only.



Figure 6. Digital inputs and outputs are easily connected via the 37-pin D-sub connector on the back of the instrument using the STP-37 screw terminal panel and 37-pin EP333 cable.

Remote Measurements

The network-ready versions of TEMPpoint (DT8871U/DT8872) provide a standard Ethernet connection to support remote monitoring and control from the field or on the factory floor. Temperature channels can be expanded by simply adding more instruments to the network.



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. TEMPpoint incorporates an independent CJC circuit for every channel. This a more costly approach, but makes TEMPpoint more accurate and more immune to temperature variations both inside and outside the instrument.

1000V Galvanic Isolation

A vast majority of thermocouple applications reside in industrial environments. By their nature, such environments create a wide variety of problems for data acquisition systems, including temperature instrumentation. Noise and high voltage inherent in industrial machinery can adversely affect a temperature measuring instrument from a relatively benign discrepancy in an acquired value to the destruction of the entire instrument. High quality galvanic isolation helps both situations.

Galvanic isolation improves system accuracy by eliminating the unwanted effects of voltage transients, ground loops, and acts as an "insurance policy" against the damaging effects of high voltages. Plus running at 10Hz provides extremely high normal mode rejection for power line related noise. The combination of isolation, Sigma-Delta inherent filtering, and the added analog filtering to remove high-frequency noise, gives the ultimate in measurement performance.

High-Stability, Low Drift Voltage References

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

TEMPpoint uses high-precision, high-stability, low-drift voltage references rated at 4 PPM per degree and 100 PPM drift per year. This means TEMPpoint 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.

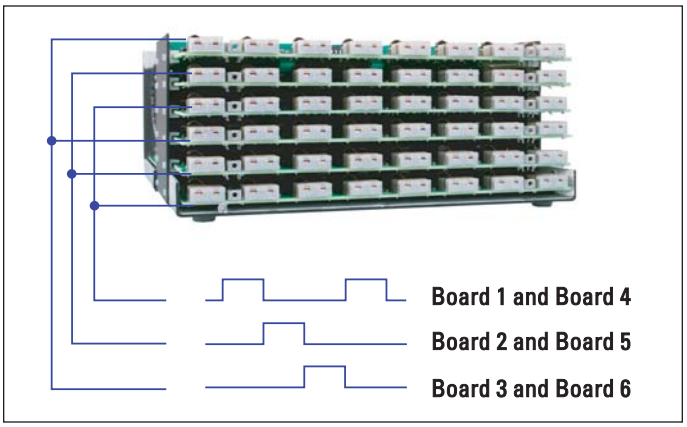


Figure 7. Custom designed DC-DC converters supply power to two non-adjacent boards at a time to reduce power surges and noise and improve system performance.

Field Calibration

Users can calibrate any TEMPpoint instrument in the field using precise calibration equipment and the TEMPpoint Calibration Utility. Since each TEMPpoint 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 TEMPpoint Calibration Utility ships with a comprehensive help file that describes the required equipment and calibration procedure, including warm-up times, for each TEMPpoint model.

For precise thermocouple measurements, use the TEMPpoint Calibration Utility with a precision voltage standard, thermocouple input cable, and an accurate temperature input source to calibrate the DT9871U and DT8871U instruments. Calibration on the DT9871U and DT8871U instruments is a 3 step process for each channel, depending on the model you are calibrating. For the DT9871U and DT8871U, calibration starts with the 24-bit A/D offset circuit. Next (for all models), the 24-bit gain circuitry is calibrated. Lastly, the error (offset) of each CJC circuit is measured based on the specified thermocouple type; this value is compared to the precise input temperature provided, and the CJC is calibrated to the specified temperature.

For precise RTD measurements, use the TEMPpoint Calibration Utility with a precision voltage standard, 4-wire RTD input cable, and precision 4K resistor to calibrate the DT9872 and DT8872 instruments. Calibration on the DT9872 and DT8872 instruments consists of two steps for each channel. First, the 24-bit gain circuitry is calibrated. Then, the 425 uA current source is calibrated.

The TEMPpoint Calibration 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.

DT9871U/DT8871U Accuracy

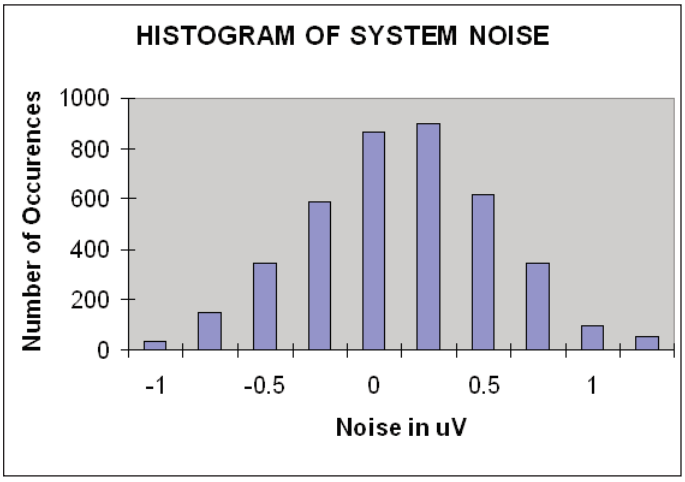
The following table shows the typical thermocouple accuracy of the DT9871U and DT8871U instruments.

	-100° C	0° C	100° C	300° C	500° C	700° C	900° C	1100° C	1400° C
Type J	± 0.17° C	± 0.15° C	± 0.18° C	± 0.15° C	± 0.15° C	± 0.15° C	± 0.15° C	± 0.15° C	—
Type K	± 0.17° C	± 0.16° C	± 0.15° C	± 0.17° C	± 0.15° C	± 0.15° C	± 0.17° C	± 0.16° C	—
Type T	± 0.16° C	± 0.16° C	± 0.16° C	± 0.16° C	—	—	—	—	—
Type E	± 0.16° C	± 0.15° C	± 0.15° C	± 0.15° C	± 0.15° C	± 0.16° C	± 0.17° C	—	—
Type S	—	± 0.2° C	± 0.18° C	± 0.18° C	± 0.18° C	± 0.18° C	± 0.18° C	± 0.19° C	± 0.18° C
Type R	—	± 0.2° C	± 0.18° C	± 0.18° C	± 0.17° C	± 0.18° C	± 0.18° C	± 0.18° C	± 0.18° C
Type B	—	—	—	± 0.23° C	± 0.21° C	± 0.17° C	± 0.19° C	± 0.18° C	± 0.17° C
Type N	± 0.16° C	± 0.16° C	± 0.15° C	± 0.15° C	± 0.15° C	± 0.16° C	± 0.16° C	± 0.16° C	—

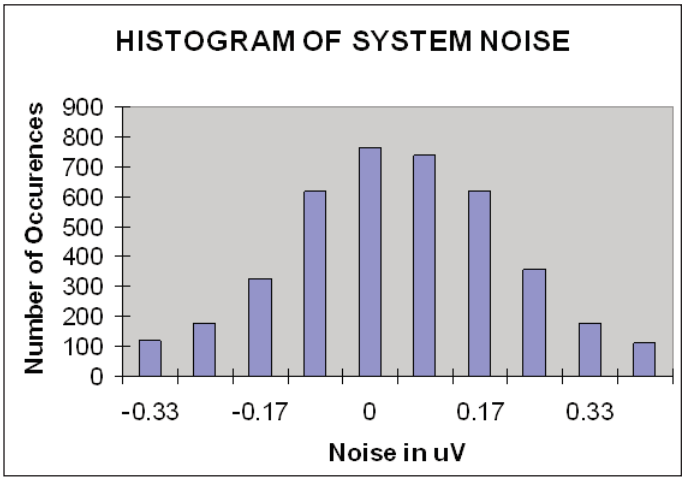
Conditions for Accuracy :

- *Warm-up time of 30 minutes.*
- *Exclusive of noise (see following histograms).*
- *Exclusive of thermocouple errors.*
- *Inclusive of typical 0.15°C CJC errors (maximum CJC error is 0.25°C).*
- *Inclusive of typical .25 µV offset error (maximum offset error is 2.5 µV).*

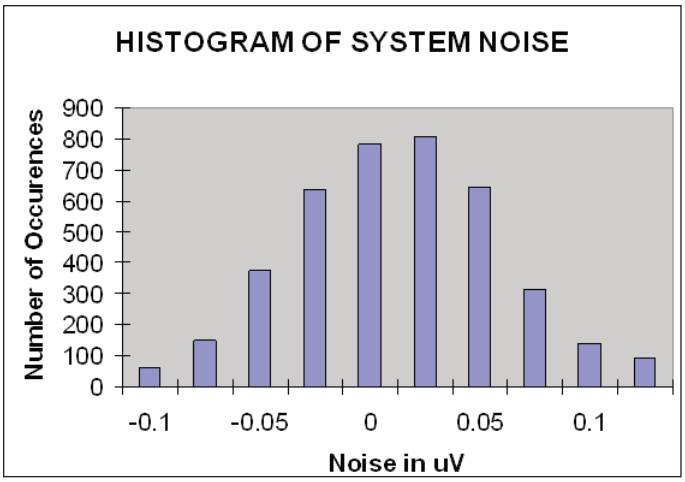
The following histograms show the Gaussian noise distribution for available TEMPpoint software filters. Converting µV error to temperature error depends on thermocouple type. For example, a K thermocouple changes approximately 39 µV per degrees C; therefore, a noise level of .1 µV adds less than .003 degrees C error (ie. 0.1 µV / 39 µV).



Raw Filter



Moving Average Filter



Quiet/Nominal Filter

DT9872/DT8872 Accuracy

The table at right shows the accuracy of the DT9872 and DT8872 instruments for several common RTD types.

Supported Measurement Range	
RTD Type	**System Temperature Error[1]**
Pt100	±0.07° C, ±0.005% of reading
Pt500	±0.01° C, ±0.005% of reading
Pt1000	±0.01° C, ±0.005% of reading

1 The system temperature error is based on the auto zero and system noise error (±0.07° C for a Pt100 RTD, ±0.01° C for a Pt500 RTD, or ±0.007° C for a Pt1000 RTD) plus the gain error of the A/D and output impedance of the current source over the voltage range (±0.005% of the reading). For example, the maximum error of a Pt100 RTD at 100° C is ±0.075° C (±0.07° C plus a gain error of ±0.005° C).

TEMPpoint Software

Capability That Fits Each Application Need

The TEMPpoint application is an executable program built with Measure Foundry. The benefit for the user is that the application can be modified or expanded to meet a particular need. For example, the user might want to apply a unique algorithm or formula to data that is derived from a thermocouple. Other extensions to the TEMPpoint application can also be achieved with Measure Foundry. These can then be distributed to run locally or remotely.

TEMPpoint Application

Your TEMPpoint instrument comes with a ready-to-measure application for measuring temperature data. Developed using Measure Foundry, the TEMPpoint application allows you to acquire temperature measurements from up to 48 thermocouple or RTD channels, display the data on the screen, and log data to disk for analysis.

You can be productive right out of the box using this software... **without writing code!** You can even export the data to other applications, like Measure Foundry, Microsoft Excel, and MATLAB for more advance analysis. And, since the project file is also provided, you can customize the application to suit your needs using Measure Foundry.

Key Software Features

- Acquire temperature data from all TEMPpoint 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 TEMPpoint discovery in your application. This allows the user the ability to easily display and select all available instruments, identifies their IP address, as well as all instrument parameters including the manufacturer, model, serial number, and operating state.

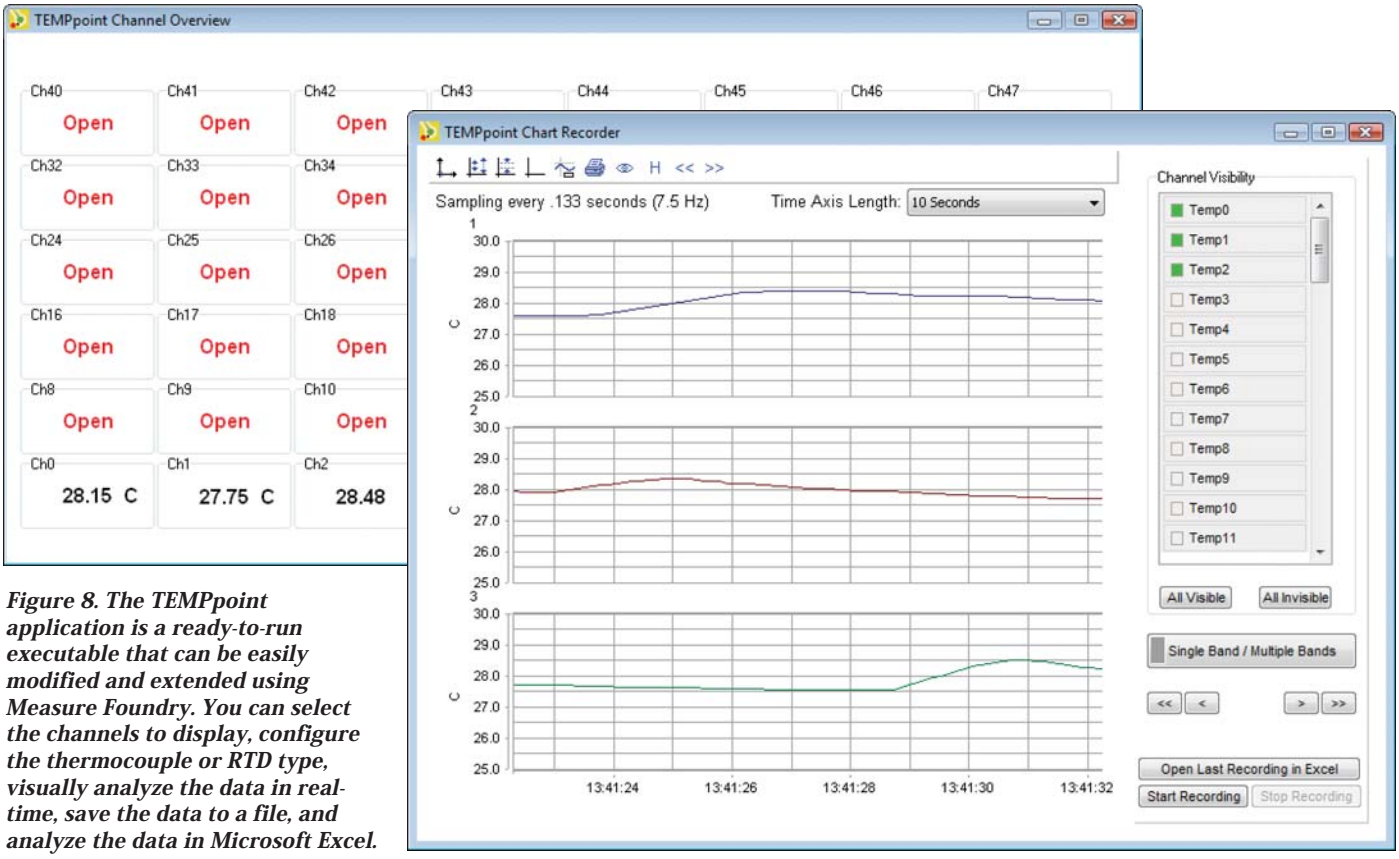


Figure 8. The TEMPpoint application is a ready-to-run executable that can be easily modified and extended using Measure Foundry. You can select the channels to display, configure the thermocouple or RTD type, visually analyze the data in real-time, save the data to a file, and analyze the data in Microsoft Excel.

Web-Based Application & Set-Up

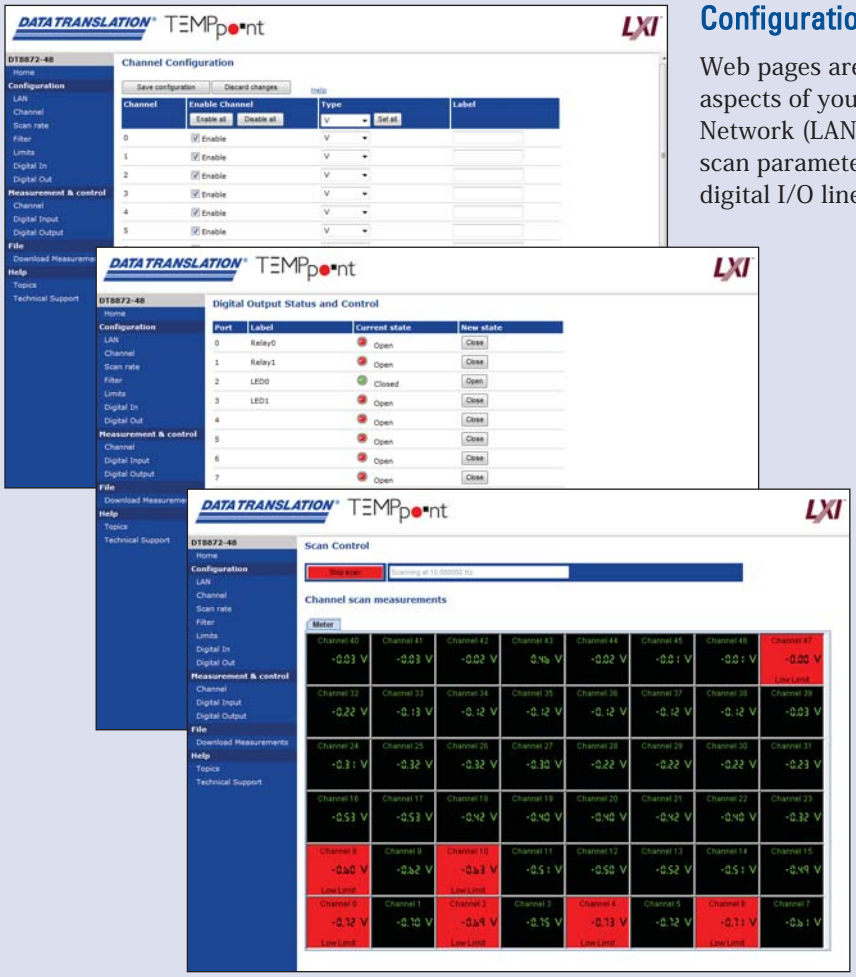
Web Access

Using our web-based application, you can configure, measure, and control the DT8871 and DT8872 instruments either locally or remotely.



The main web page shows information about your TEMPpoint instrument on the network.

Web pages are provided for configuring the following aspects of your TEMPpoint instrument: Local Area Network (LAN), input channels that you want to measure, scan parameters (such as the scan rate), alarm limits, and digital I/O lines.



Configuration Web Pages

Web pages are provided for configuring the following aspects of your TEMPpoint instrument: Local Area Network (LAN), input channels that you want to measure, scan parameters (such as the scan rate), alarm limits, and digital I/O lines.

Measurement & Control Web Pages

You can use the measurement and control web pages to start or stop a scan, update the value of the digital output port, or read the value of the digital input port.

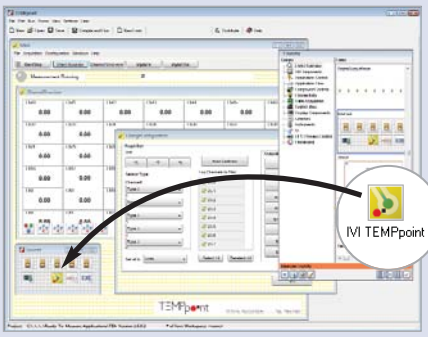
Programming Options

For All Versions:

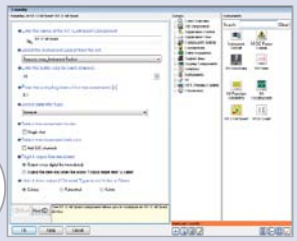
Measure Foundry

Measure Foundry is a rapid application development package that provides a system solution for your TEMPpoint Instrument. Measure Foundry fulfills the promise of being able to build complex temperature measurement applications easily and without writing any code. The TEMPpoint application that ships with the instrument can be easily modified using this package.

3 Easy Steps to create your temperature measurement application



1) Drag and drop your components to create your application.



2) Configure the components through property pages.



3) Compile and Run

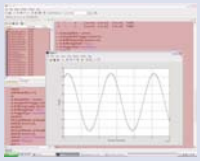
For USB Versions Only:

Getting Started with TEMPpoint



The Getting Started example application for TEMPpoint is a temperature measurement application written using Visual Basic.NET and the DT-Open Layers for .NET Class Library. Using this application, you can quickly verify the operation of your instrument. Since the source code is provided as an example for the DT-Open Layers for .NET Class Library, you can customize this application as you wish.

DAQ Adaptor for MATLAB



Data Translation's DAQ Adaptor provides an interface between the MATLAB Data Acquisition (DAQ) subsystem from The MathWorks and Data Translation's DT-Open Layers architecture.

DT-Open Layers for .NET Class Library



The DT-Open Layers for .NET Class Library is a collection of classes, methods, properties, and events that provides a programming interface for DT-Open Layers-compatible hardware devices. It can be used from any language that conforms to the Common Language Specification (CLS), including Visual Basic.NET, Visual C#, Visual C++.NET with managed extensions, and Visual J#.NET.

Win32 SDK



This SDK consists of the necessary header files, libraries, example programs, and documentation to develop your own DT-Open Layers data acquisition and control applications. It is intended for use with non .NET languages, such as ANSI C, Visual C++ 6.0, and Visual Basic 6.0

For Ethernet (LXI) Versions Only:

IVI-COM Driver

This driver is provided to write application programs for TEMPpoint 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® from the MathWorks® to program TEMPpoint instruments.

SCPI Commands

Use network sockets to program and control TEMPpoint LXI instruments by sending SCPI commands

Ordering Guide

TEMPpoint

USB Instruments

Thermocouple:
DT9871U-XX

RTD:
DT9872-XX

Ethernet (LXI) Instruments

Thermocouple:
DT8871U-XX

RTD:
DT8872-XX

-XX = Number of Channels

8 Channels (-08)
16 Channels (-16)
24 Channels (-24)
32 Channels (-32)
40 Channels (-40)
48 Channels (-48)

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 TEMPpoint instrument
- **EP373 –** Single Rack-Mount Kit
- **EP374 –** Dual Rack-Mount Kit

For more information about TEMPpoint, please visit:
http://www.datatranslation.com/go/TEMPpoint/

For specifications, drawings, and pin assignments, please visit:
http://www.datatranslation.com/go/TEMPpoint/techinfo/

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Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

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