Setting the Standard for Automation™

Hamilton Section
Hamilton, Ontario, Canada

50th Anniversary

Fall 2012 Newsletter

In this Issue

Upcoming Events

Oct 30th, 2012…….Members meeting:
"RFID- A Sea of Change"
Presented by George Roberts-Beacontree Technologies
6:00pm at ABB Canada, 3450 Harvester Road, Burlington

Nov 6-7, 2012…….APPRO: 24th Annual Canadian Power Conference
Metro Toronto Convention Centre

Nov 27th, 2012…….Members meeting:
"**IEEE 519 Limits in variable frequency drive applications. "**
Presented by: Al Archambault/Mirus International Inc.
6:00pm at ABB Canada, 3450 Harvester Road, Burlington

Section President
Kenneth Hamilton

Newsletter Editor
Jennifer Loeffler

Editor Assistant
Graham Nasby

1. ISA Hamilton Executive Summer Social

Photo from the ISA Hamilton Summer Social. Kenneth Hamilton President ISA Hamilton (left) and Wally Nickel WebMaster (right).

As part of a tradition going back almost 50 years, the ISA Hamilton Executive hosted its annual summer social this past June. Hosted by Wally and Linda Nickel, the summer social was a chance to kick back and enjoy another successful year for the section. Master chef Ken Hamilton also got a chance to show Wally what good barbecuing is all about. Notice the special cooking aprons in the photo. A big thank you to our executive for another year well done. Want to join the party? We are always looking for additional volunteers to help out on the board. See the contacts page in this newsletter.

2. Postal Mailing Address Update

The address at which we receive mail has changed. Please update your records to show the new ISA Hamilton Section mailing address. Our new mailing address is:

ISA Hamilton Section Inc.
2030 Headon Forest Drive
Burlington, Ontario,
L7M 2M3

Our website address is. however, still unchanged. You can always visit us online at:

www.isahamilton.com

Technical Article

3. Current Loops – Transmitting Sensor Data the Old School Way with 4-20mA

Why Use a Current Loop?

Many sensors are voltage output devices. Attempting to transmit a voltage over long distances has numerous drawbacks. Losses due to wiring and interconnect resistance will produce lower voltages at the receiving end. Using devices with high impedance inputs to reduce loading is not practical because of the dramatic increase in noise sensitivity. Shielded wires could be used to minimize noise pickup, but this gets costly when long distances are involved.

Industrial process monitoring applications traditionally solved this problem using current loops to send sensor data. Cumulative loop drops will not reduce the accuracy of a current signal until the transmitter has reached its maximum output voltage.

Loop operation is straightforward - a sensor's output voltage is converted to a proportional current, with 4mA representing the sensor's zero-level output, and 20mA representing the sensor's full-scale output. A receiver at the remote end converts the current back into a voltage that is available for further processing. The live-zero represented by 4mA allows the receiving instrument to detect wiring failures and permits transmitters to be loop powered. (called two-wire transmitters).

Current Loop Components

A typical 4-20mA current-loop circuit is comprised of a sensor/transducer; a transmitter, a loop power supply; and a receiver/monitor. In loop powered applications, all four elements are connected in a closed series circuit. Sensors provide a voltage whose value represents the measured parameter. The transmitter amplifies and conditions the sensor's output, then converts this voltage to a proportional 4-20mA dc current. The receiver/monitor converts the current signal back into a voltage that can be further processed and/or displayed.

In loop-powered applications, the power supply's internal elements also furnish a path for closing the series loop. 24VDC is still the most widely used power supply voltage in 4-20mA process monitoring applications. This is largely because 24V is used to power many of the other instruments and electromechanical components found in industrial environments. Lower supply voltages, such as 12V, are also popular since they are used in computer-based DAQ systems

Loop Drops

A process monitor presents a load or loop burden to a transmitter's output driver. Most data sheets will specify a maximum loop resistance the transmitter can drive while providing a full-scale 20mA output. Given that the voltage drop developed across a current carrying resistor can be found by multiplying the resistor's value by the current passing through it and that the sum of the voltage drops around a series loop has to be equal to the supply voltage. To calculate the loop drop:

Vd (voltage drop) = I (current through the resistor in amperes) x R (value in Ohms).

Every component through which the current passes will develop a maximum voltage drop equal to that component's resistance multiplied by the full scale current or 0.020 Amperes (20mA). For example, a loop powered monitor with a 250 ohms resistance yields a maximum voltage drop:

$$Vd = 0.020A \times 250 \text{ ohms} = 5.0V$$

Transmitter Power Ratings

Transmitter specifications usually provide both minimum and maximum operating voltages. The minimum voltage is that required to ensure proper transmitter operation (typically 8V), while the maximum voltage is determined by its maximum rated power dissipation.

A transmitter's power dissipation can be determined by multiplying its maximum over range loop drop by the highest anticipated output current. For example, if a transmitter drops 30V at an over range output of 30mA, its power dissipation is:

$$30V \times 0.030A = 0.9 \text{ watts}$$

Wiring Resistance

Copper wires exhibit a DC resistance proportional to their length and diameter. Applications in which two or more devices are connected over long wiring distances (1000 - 2000 feet) normally use 24VDC supplies.

The voltage drop developed along a given length of wire is found by multiplying the wire's total resistance by the current passing through it. A wire's resistance can be found by looking up its resistance (ohms per 1000 feet) in a wire spec table.

For example, assume a transmitter is connected to a remote process monitor using 2000 feet (660 meters) of #26 solid copper wire (40.8 ohms per 1000 feet). Since the current must travel 2000 feet to the process monitor and another 2000 feet back to the transmitter the total loop resistance (R) is equal to:

4000 feet x (40.8 ohms /1000 feet) = 163.2 ohms

The total voltage dropped over the 4000 feet of wiring is therefore,

Vd = 0.020A x 163.2 ohms
Vd = 3.27V.

The process monitor will have a loop drop of 250 Ohms x 20mA = 5V.

The total loop drop seen by the transmitter will be the sum of the 3.27V wire drop and the 5.0V process monitor drop, for a total of 8.27V. If the transmitter requires a minimum of 8V for normal operation, the lowest power supply voltage required for the system will be 8.27V + 8V = 16.3V

ABOUT THE AUTHOR:
Glen C. Taylor *is the owner of eWerks Inc. (www.ewerksinc.com) for over 25 years he has been involved in the design and manufacture of industrial electronics. His blog is available at www.ThingsThatGoBlink.com. Glen holds a Master of Science degree (with distinction) in Electronic Product Development from the University of Bolton in the UK, a CID certification in circuit board design from IPC Designers Council, and is an authorized Microchip Design Partner. He is also a senior member of IEEE and the ISA.*

4. Making the Most of your ISA Membership: ISA Automation & Technology Technical Divisions

By Graham Nasby

This article is part of a series of articles about taking advantage of the resources and opportunities that come with your ISA membership.

In last issue's column we gave an overview of the ISA's Industries and Sciences technical divisions. In this article we will be covering the second group of ISA technical divisions: The Automation and Technologies Divisions. ISA members have the option of joining two technical divisions (one in I&S and one in A&T) at no extra cost as part of their ISA membership. ISA members can also join additional divisions for a small annual fee.

Overall, the ISA has two groups of technical divisions. The first grouping is the "Industries and Sciences" department which hosts divisions is focused on the needs of specific industries. The second grouping is the "Automation and Technology" department which hosts divisions is based on individual technologies and technical aspects of automation.

Today's article provides an overview of the ISA's "Automation and Technology" divisions. Listed in alphabetical order, the divisions in the Automation & Technology Department are as follows:

- Analysis Division
- Automatic Controls and Robotics Division
- Communications Division
- Management Division
- Process Measurement & Control Division
- Safety Division
- Test Measurement Division

The **Analysis Division** contributes to the careers of professionals who are involved in every aspect of process stream and laboratory methods of analysis—from theory and development to application, training, calibration, and more. The analysis division's role at ISA is to facilitate program development, implementation and effectiveness through integrated

planning, measurement, evaluation and interventions; and to support your specialty; such as spectroscopy, chromatography, electrochemistry, and sample handling. The analysis division hosts the annual ISA Analysis Division Symposium.

The **Automatic Controls and Robotics Division** (ACARD) of ISA aims to address the control demands of complex systems by exchanging knowledge with leader's regarding new and innovative solutions that are relevant to industrial applications, geological processes, and principles and practices of automatic control.

This **Communications Division** is focused on the equipment, software, and protocols involved with transmitting, reporting, and processing of real-time data, including concepts relating to data acquisition, processing, storage and transmission, information theory, and industrial IT. The work includes data transmission to/between sensors and real-time computing/control systems via analog, serial, fieldbus, Ethernet, and wireless methods. In reality, this means the communications division is concerned with all the "magic" that makes it possible for control systems to work. The Communications Division hosts is own annual symposium and related wireless technology workshops.

The **Management Division's** mission is to support ISA membership, from all industry segments, who are involved (or having an interest) in management as it relates to instrumentation, systems and automation assets to help them compete more effectively both professionally and personally in today's global marketplace. It also provides an organizational structure and environment where members can develop their skills, knowledge, as well as, share their knowledge and experience with those currently in management or preparing for a future management role. The Management Division hosts the annual ISA Marketing and Sales Summit.

The **Process Measurement and Control Division** (also known as PMCD) is organized within the Automation and Technology Department of ISA. The primary goal of PMCD is to advance the interests and knowledge of its members. PMCD supports its nearly 6,000 members by operating Technical Committees, publishing an industry-specific newsletter and participating with other ISA divisions in technical symposia. PMCD focuses on primary sensors, control hardware and software, and final control elements. The Process Measurement and Control Division, along with the Test and Measurement Division, hosts the annual ISA International Instrumentation Symposium (IIS).

The **Safety and Security Division** (SAFE) is concerned with the safety and security aspects of automation, including the application of ISA84 and ISA99. It programs safety and security related sessions at ISA conferences, maintains a website, runs a listserv, and publishes a newsletter. Division also has the following subcommittees: Alarm Management, Burner Management Systems, Control Systems Security, Fire and Gas Protection and Detection Systems, Medical Safety, Nuclear Safety, Offshore Safety, Safety Field Equipment, Safety Instrumented Systems (SIS), and Safety Management.

The **Test and Measurement Division** (TMD) promotes the technical areas associated with measurements for tests including instrumentation and sensor development, application of instrumentation and measurements to test, calibration of instrumentation systems, accuracy of the instrument output, and design of instrumentation system data acquisition and processing architecture that turn the measurement or sensor output into knowledge of the test article's performance, operability, structural integrity, maintainability and functionality. Along with PMCD, the Test and Measurement Division hosts the annual ISA International Instrumentation Symposium (IIS).

Make sure to make use of the two free division memberships that come with ISA membership!

NEXT ISSUE: ISA InTech Magazine

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5. Golf Tournament

May 2012 was yet another successful golf tournament for ISA Hamilton. Our 11th annual ISA Hamilton Golf Tournament at Chippewa Creek brought out 154 golfers and outstanding weather.

Thank you again for our sponsors, volunteers and people that participated in the event.

The winning team with the lowest score was once again the foursome from CEM Specialties: Nicholas Timmers, Gary Saunders, Ken Dinel, Kon Bouttarath.

The winners for the "Most Honest Team" was the Gescan foursome.

Save the date: 12th Annual ISA Hamilton Golf Tournament will be held at Chippewa Creek Golf Club on Friday May 24th, 2013. See you next year!

SAVE THE DATE

ISA Hamilton

EXPO 2013

Instrumentation & Process Technology Exhibition & Conference

Wednesday, April 3, 2013

9:00 AM to 5:00 PM
FREE ADMISSION

Trade Show, Seminars, and Exhibits

Royal Botanical Gardens
680 Plains Road West.
Burlington, Ontario

6. Member Meetings: Call for Speakers

As a service to its members, the ISA Hamilton Section holds monthly membership meetings. The meetings consist of dinner and a speaker. The meetings generally start at 6:00pm, followed by a 45 minute seminar that begins at 6:30pm.

Meetings are open to both members and non-members of the ISA. Pre-registration is requested so that we know how many dinners to order. Please see our website for the current meeting schedule.

We are currently seeking speakers for several of our upcoming membership meetings. We actively welcome talks from vendors, consultants and end-users. For vendors we do ask that the talks be technical in nature rather than sales presentations.

Please visit our website to see what meeting presentation slots are available. Feel free to contact us if you are interested in sharing your knowledge with your fellow automation professionals through our membership meetings program. We look forward to seeing you at our next meeting.

7. ISA Hamilton Section Contacts

For more information about ISA membership, the ISA Hamilton section or the upcoming section events, please do not hesitate to contact any one of us. (Email addresses are @isahamilton.com)

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The ISA Hamilton Section is the local section of the International Society of Automation for the Hamilton, Burlington, Guelph and Golden-Horseshoe areas of Southern Ontario, Canada. ISA Hamilton Section holds regular meetings, sponsors a variety of educational endeavors, produces an annual exhibition, encourages an open exchange of career opportunities, and promotes the goals & objectives of ISA. More info: www.isahamilton.com

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