

ANNUNCIATOR

JULY 1997



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Editor's Notes

ADVERTISERS: Please note that the deadline for the SEPTEMBER ANNUNCIATOR is August 15, 1997. Please forward information to the editor by that date in order to have items updated.

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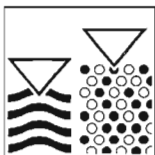
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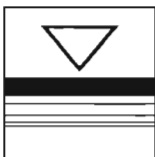


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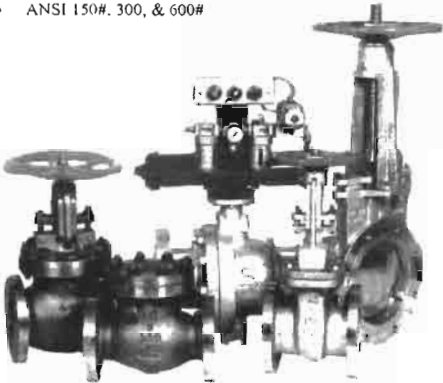
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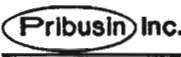
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Outgoing President's Message

As the out going President this will be my last message during my term of office. During the year I have emphasized many times the importance of strengthening our membership. Membership is rather important to any organization and we, the Sarnia Section of the ISA, is not an exception. We need members who are willing to learn about the ISA and provide leadership and communication to the members and community. Again I ask anyone of our members who wish to pursue the challenge of leadership development to step forward as there are some positions that open to complete our full slate of officers.

We had a good year, we had good executive meetings with specific goals and we focused our energy to meet our goals. Our Newsletter has done an excellent job establishing a profitable newsletter, but to maintain this ideology we need more articles of interest for the members. We had well attended training seminars put on by our Education Committee. Our Show Committee has done an excellent job in achieving a successful show. The golf committee has proven to provide another successful event.

To the executive and committee members, I thank you for your support. The success for this year would not have been possible without all your help and the team action that was evident throughout the year, it made my job enjoyable and easy.

At our Awards Dinner we gave out Past President pins, Senior Member pins and honoured each executive member and committee with an ISA embroidered jacket. It is a small way to recognize such dedicated work. To the community, we have donated to the Sarnia and District Children Treatment Centre \$5000 for audio equipment for testing the children's hearing in the Sarnia area.

My term is not finished with the ISA, I will be working as the Section's Delegate and I will be re-writing our constitution and bylaws to be in line with the main organization's bylaws.

I ask all of you to give your new executive and new President, Andy Tucker your full support in providing a successful year.

Regards,

Randy Dennie, *Immediate Past President*

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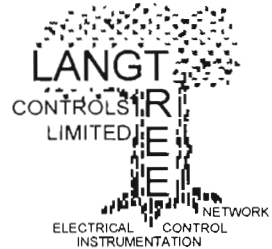
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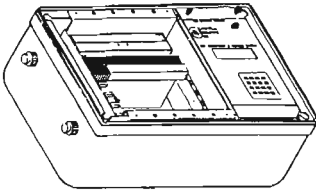
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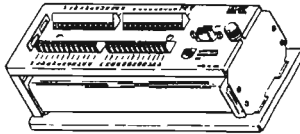
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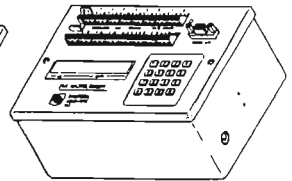
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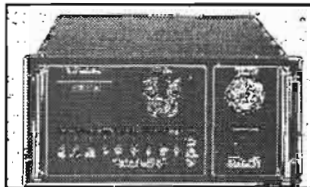
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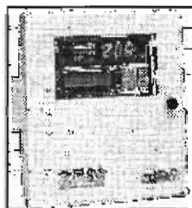


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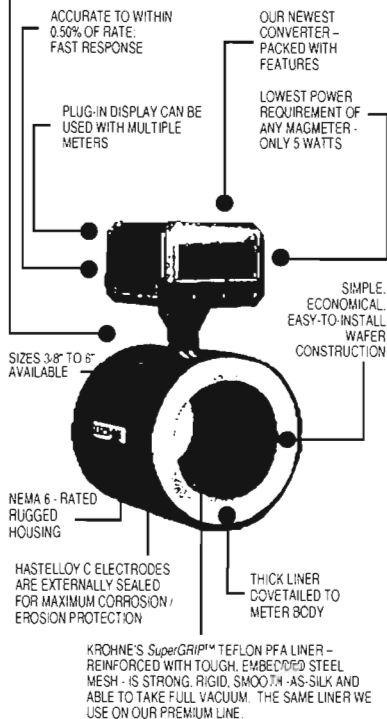
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Reduction in Flow Measurement Uncertainty by Real-Time Temperature and Pressure Compensation

Introduction

Even with the advent of several new technologies over the last two decades, head type flowmeters are still the most commonly used flow measurement device. This flow measurement technique creates a differential pressure across a restriction (e.g. orifice plate) in the flow channel.

The major limitation of the measurement technique is the low rangeability. A turndown of 3:1 is the convention for orifice meters. This is significantly lower than many of the newer technologies; vortex meters can achieve 38:1, and coriolis meters achieve 100:1. One way of achieving higher rangeability with head type meters is through real-time temperature and pressure compensation.

This paper presents results that show how real-time temperature and pressure compensation can increase rangeability.

Theoretical Background

The following equation describes the flow of a fluid through a restriction:

$$Q_m = NC_d E Y_1 d^2 \sqrt{\rho h} \quad (1)$$

where: Q_m = mass flow rate (mass/time)

N = units conversion factor (dimensionless)

C_d = discharge coefficient (dimensionless)

E = velocity of approach factor (dimensionless) $E = \frac{1}{\sqrt{1-\beta^4}}$ where $\beta = \frac{d}{D}$

D = meter tube bore (length)

Y_1 = gas expansion factor (dimensionless)

d = orifice bore (length)

ρ = fluid density (mass/volume)

h = differential pressure

In order to simplify the calculation, it is common practice to use the following equation for liquids:

$$Q_m = K_1 \sqrt{h} \quad (2)$$

and:

$$Q_m = K_2 \sqrt{\frac{hP}{T}} \quad (3)$$

for gases.

These simplified equations assume that most of the terms in the original equation are constant over the operating range. In fact, only the units conversion factor is constant, the remaining terms vary with operating conditions (temperature, pressure, and flow). By assuming that these parameters are constant, significant errors are introduced in the flow rate calculation.

(Continued on Page 29)

Tables 1 and 2 show the contribution that each of the terms in Equation 1 make to the overall uncertainty in the flow rate¹

Table 1: Contribution of Equation 1 terms on overall gas flow uncertainty.

Term	% Contribution
C_d	84.30
Y_1	2.73
D	3.32
d	6.06
h	0.33
ρ	3.26
Total	100

Table 2: Contribution of Equation 1 terms on overall liquid flow uncertainty.

Term	% Contribution
C_d	86.95
Y_1	0.00
D	3.43
d	6.25
h	0.34
ρ	3.03
Total	100

The above data shows that variations in the discharge coefficient are the major source of error. These errors can be reduced by real-time calculation of C_d , Y_1 , D, d, and ρ as they vary with operating conditions.

Improvements by Temperature and Pressure Compensation

By including real-time temperature and pressure compensation the performance can be significantly improved. Temperature and pressure compensation redistributes the sources of error; reduces the contribution by variations in the "constant" terms.

Figures 1, 2 and 3 show how the gas flow uncertainty is reduced with temperature and pressure compensation².

Conclusion

By incorporating real-time temperature and pressure compensation, the contribution to flow uncertainty of variations in parameters that are usually considered to be constants are reduced significantly. This reduction in uncertainty allows 8:1 rangeability with orifice type meters that were conventionally limited to 3:1.

¹ Wiklund D. E., and Englestad, L. M.: "Improving Flow Measurement by Real-Time Flow Calculation in Transmitters having Multiple Process Variables", *ISA New Orleans Conference*, 1995.

² Wiklund D. E., *ibid*.

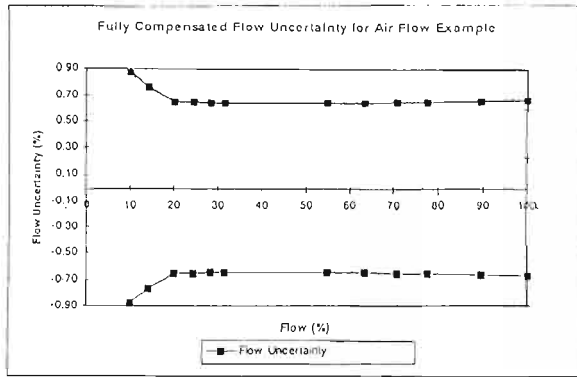


Figure 1. Flow Uncertainty vs. Flow Range (Fully compensated air flow)

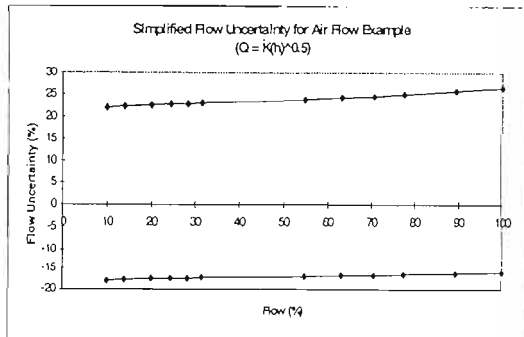


Figure 2. Flow Uncertainty using Simplified Flow Equation vs. Flow Range
 $(Q_m = K_1 \sqrt{h})$

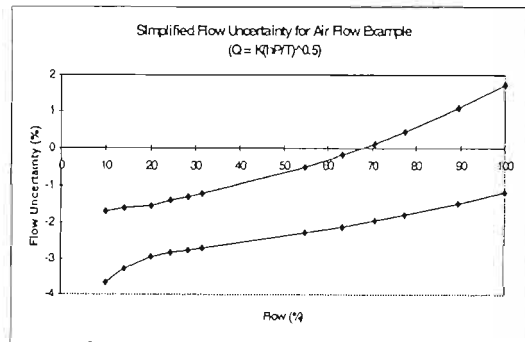
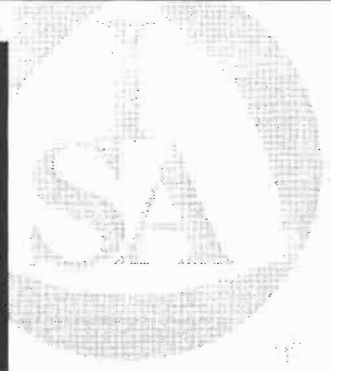


Figure 3. Flow Uncertainty using Simplified Flow Equation vs. Flow Range
 $(Q_m = K_2 \sqrt{\frac{hP}{T}})$

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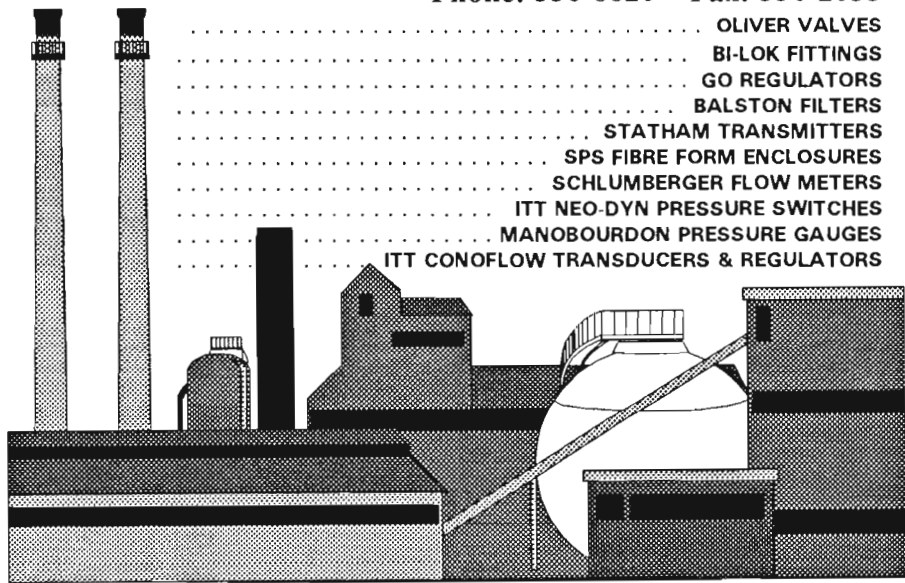
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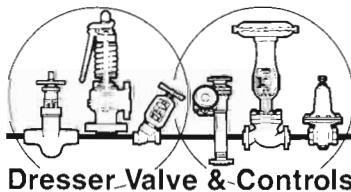
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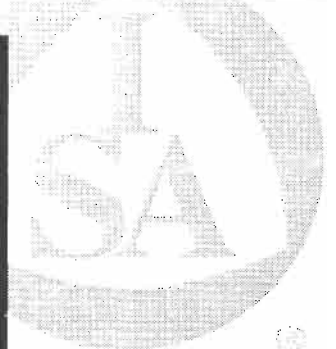


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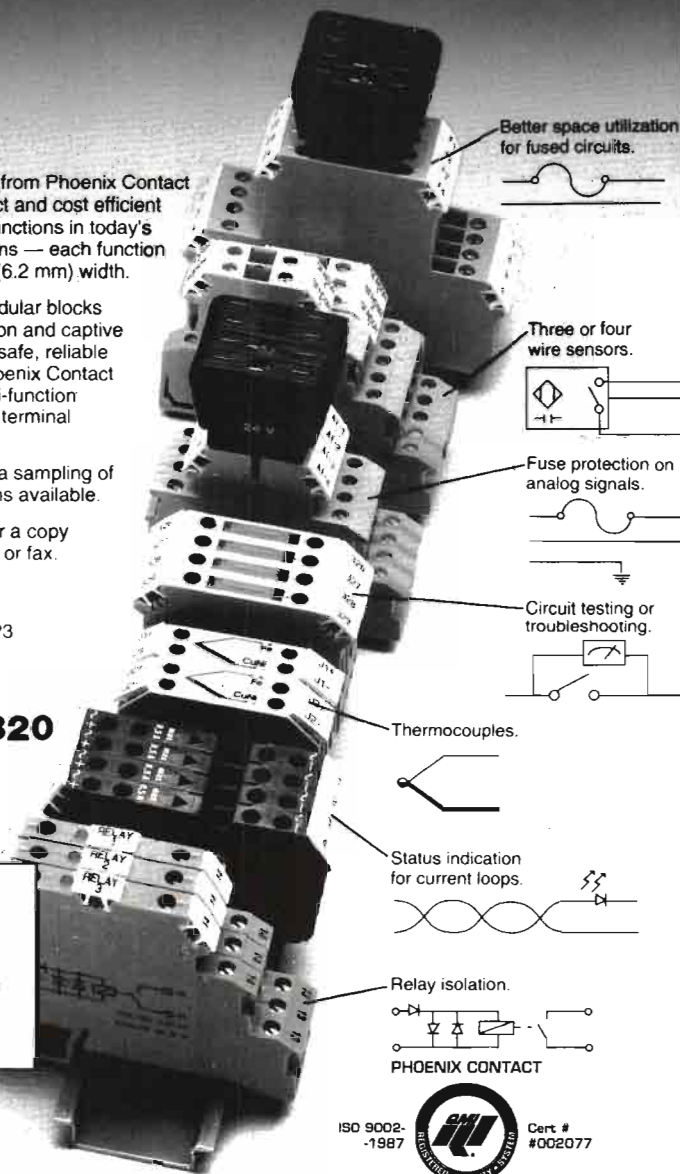
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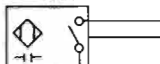
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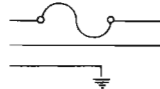
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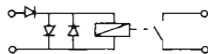
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


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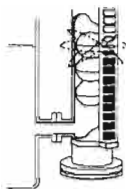


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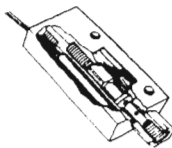
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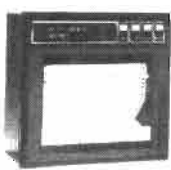
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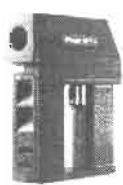


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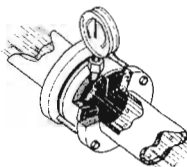
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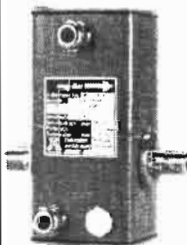
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Fieldbus Today... Resources on the Web

The Web links listed in this article are posted on my Fieldbus web page at:

<<http://www2.ebtech.net/~bsmith/fieldbus.htm>>

which is also listed on my home page at:

<<http://www2.ebtech.net/~bsmith/>>

Fieldbus seems to be a hot topic again. Recent articles in a number of magazines and on websites, point to a new chapter of the Fieldbus saga. The current chapter could be called Finalizing the Foundation Fieldbus Standard. Once the standard is completely approved it will allow products to be sold that conform to the long awaited standard. The next chapter could be called First Generation Foundation Fieldbus Products for Sale. Finally, we will be able to look closely at actual products. The March 1997 issue of InTech included an article called "Standardized File Exchange Eases Fieldbus Interpretability Design".

The April issue of Control magazine included an article titled "Fieldbus Reaching the Promised Lan". With the release of conformance and interpretability test kits, Foundation Fieldbus is one step closer to putting products in users' waiting hands.

An article at the Fisher Controls website called "Understanding Fieldbus" states: "One of the most anticipated changes in the process industry has been the introduction of fieldbus. Ten years in development, fieldbus has been long awaited by many process control industry users. In March 1996, the Fieldbus Foundation will release the low speed (H1) fieldbus technology. With this release, a fully functional fieldbus will be defined."

"Putting Fieldbus to Work" is another article from the Fisher Controls website that tells about the world's first commercial application of products conforming to the Fieldbus Foundation's final specification, a major Canadian chemical company's plant is using Foundation™ fieldbus-based architecture on a furnace application.

An article titled "Honeywell presents solution-centric fieldbus Approach" states it this way: "fieldbus must be more than a data pipeline. Its value lies in its ability to provide an unprecedented richness of data to the applications and services that lower product cost and improve quality. To that end, Honeywell has taken a "solution-centric" approach to the implementation of fieldbus, rather than merely a "field-centric" approach."

Fieldbus Foundation or FOUNDATION Fieldbus? "Fieldbus is coming-fast. This article explains what it is, what it will mean to you and your business and how the major international equipment suppliers are working together to ensure a single, world-wide, standard approach for interoperable measurement and control equipment."

Jim Pinto, of Action Instruments, has written "Pinto's Law of Market Confusion" As Applied to Industrial Fieldbus Networks. This article states: "For several years now, there has been a significant amount of confusion over "Fieldbus" industrial networks. Users and vendors alike have recognized the inexorable trend towards industrial networking – simplify wiring, reduce cabling costs, improved flexibility, easy system expansion or modification, increased fault-tolerance, local and remote communications ability, maintenance and operating diagnostics – the list of benefits goes on and on. And, of course, one of the major advantages is "Inter-operability" - connecting the widgets made by Vendor-A to the doo-dads made by Vendor-B, all on the same network, speaking the same language. What a wonderful world that would be...!"

The Readout Instrumentation Signpost website in Ireland has a Fieldbus page called

Catching the Bus - Towards a Standard in Digital Communications. This page has many web links including other Fieldbus sites. The Research Center for Automatic control of Nancy, in France has a Fieldbus page as does the Austrian Centre of Excellence for Fieldbus Systems. INFIDA - The Internet Fieldbus Database is another resource well worth keeping in touch with. There are also links to Bus Web pages such as: Acnet, BitBus, CAN, Open DeviceNet, CEBus, DIN-Messbus, EIB, InterBus, LonWorks, MiTS, ModBus, Profibus, SDS, ISA SP50, plus others.

PROFIBUS (PProcess FieldBUS) is the leading open fieldbus system in Europe, according to an independent study consultant, and it enjoys world-wide acceptance. If you are interested in this bus read the technical overview page.

There is a lot of Fieldbus information available in magazine articles, from the bus organizations and vendors plus the websites referenced above.

Brian Smith

Internet: bsmith@ebtech.net
 smithb@novachem.com

Home Page: www2.ebtech.net/~bsmith

ISA Magazine's on the Web

ISA Online includes an online version of the InTech Magazine. Technical articles from recent issues are available at:

WWW.isa.org/journals/intech/index.html

Industrial Computing Magazine articles are also online at:

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DIVISION NEWS

ISA Construction & Design Division

This ISA Division Mission Statement was recently updated to read:

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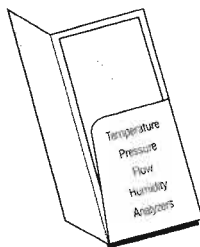
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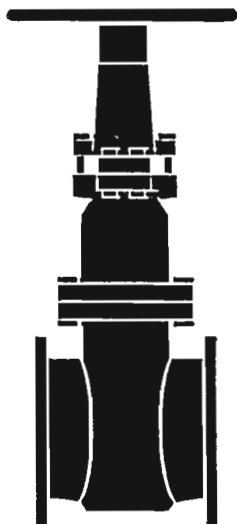
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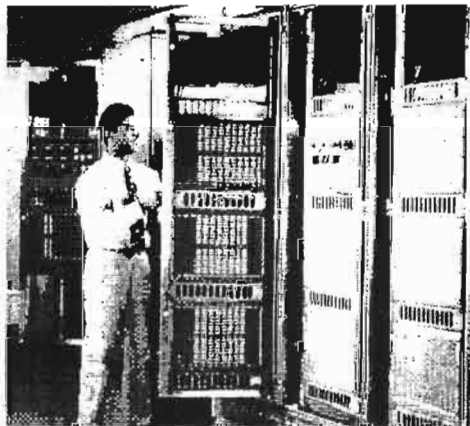


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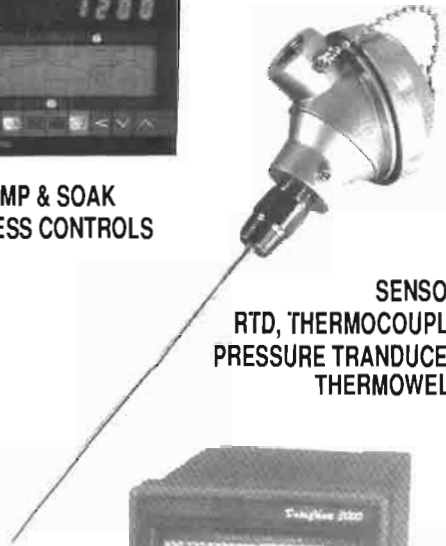
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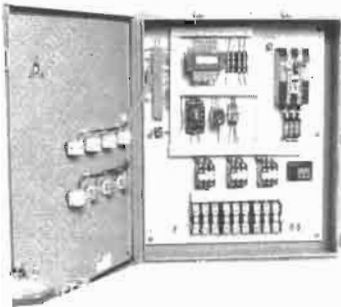
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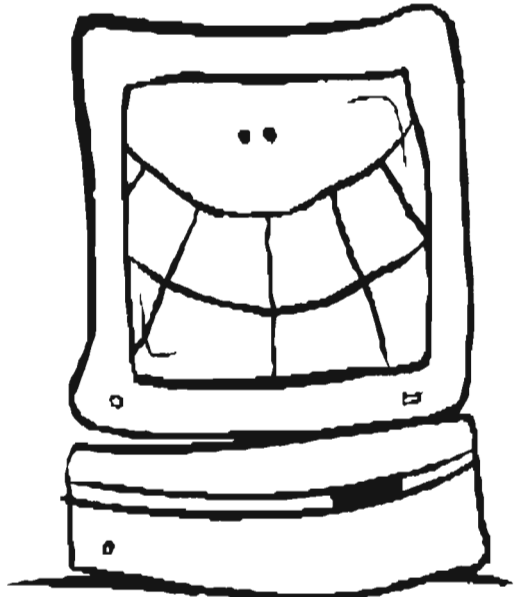
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Our group account is \$10/month for 10 hours. (3 month contract = \$32.10 incl. GST). Extra hours cost \$1.00/hour. ISA new user setup fee is \$10. If you use more than 20 hours per month I would recommend switching to the normal 3 month contract, which costs \$75.00 including GST for 50 hours / month. Electro-Byte is offering free classes for New Users, Intermediate Users, Search Engines, Chat Programs and E-mail Programs.

The Sarnia Section Home Page can be found at:
<http://www2.ebtech.net/~bsmith/isasarni.html>

SARNIA SECTION BBS UPDATE

As of June 15th the BBS has received 1700 calls. There have been 640 messages in the Main Board conference, 1394 downloads and 38 uploads. There have been three new callers since the last report. There are also copies of other popular Internet programs plus copies of Instrument Sizing and selection programs. The BBS phone number is (519) 541-0427.



NEWS RELEASE

VALTEK

Valtek Controls & Valtek International are pleased to announce that Matheson Valve & Fittings Ltd. (MVF) has been named as the Valtek and Kammer representative for the sales territory in Southern Ontario replacing Controls Equipment (Mississauga) Ltd. This change is effective May 1, 1997.

Matheson Valves & Fittings Ltd., an ISO 9003 Registered company, has already demonstrated a commitment to a superior level of customer service to our customers for Valtek and Kammer products from their Montreal operation and is determined to service Southern Ontario customers with exceptional support.

Matheson Valves & Fittings Ltd. has offices located in Sarnia, Oakville, Ottawa and Montreal.

Your Valtek and Kammer area representative can be contacted at:

Matheson Valves & Fittings

2-1200 London Road, Suite 242, Sarnia, Ontario N7S 1P4

Tel: (519) 541-2360 Fax: (519) 541-2364

MATHESON VALVES & FITTINGS LTD.

We are extremely pleased to announce that **Gary Coles** has joined Matheson Valves & Fittings Ltd. as **Territory Manager** of our Sarnia Sales Office. Gary is a proven technical sales professional who has worked in the Sarnia area for most of his career selling and servicing valve and instrumentation products at the chemical, petrochemical and oil refinery businesses throughout the "Chemical Valley" and Southwestern Ontario.

Please contact Gary for your *manual, automatic on/off and modulating control valve* requirements at:

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Rosemount Instruments

CALGARY, AB (May 1997) – Fisher Rosemount has issued a new brochure entitled PlantWeb. The brochure introduces the new PlantWeb field-based architecture that securely links intelligent field devices, scaleable platforms and software giving customers information, control and management capabilities needed to increase performance levels and lower costs.

For a free copy of the PlantWeb brochure, call 1-888-PLANTWEB, ext. 103, or visit us at <http://www.fisher-rosemount.com>.

The new PlantWeb™ field-based architecture from Fisher-Rosemount™ combines intelligent field devices, scaleable platforms, and modular software to provide not only process control but also integrated asset management.

MOORE PRODUCTS CO. (CANADA) INC.

Moore Products Co. (Canada) Inc. is pleased to announce that Summit Controls Ltd. has been appointed the Moore Products and Krohne representative for these products in Southern Ontario. Summit Controls has offices in Cambridge and Sarnia and can be reached at: **1355 Confederation Street, Sarnia, Ontario N7S 4T2**

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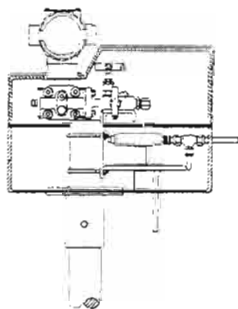
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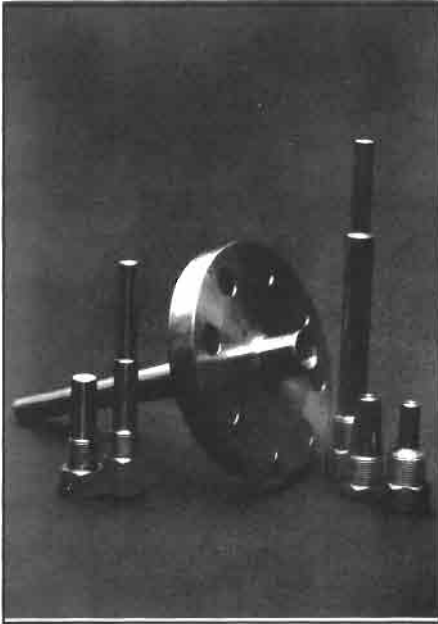
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14. This is probably as bad as it gets, but don't count on it.
15. All other things being equal, fat people use more soap.
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- Check Money Order
 - American Express Eurocard MasterCard Visa
- Acct # _____ Exp. Date _____

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Credit Card Payment is preferred; checks with proper MICR bank encoding must be drawn on your bank's corresponding NY or other US bank. Amount payable to ISA must include any bank or other processing charges.

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Durham, North Carolina 27702
USA

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Division Enrollment — Also enroll me at \$5.00 each in the Divisions checked below. To join Divisions, you must also enroll as a regular or student member.

4

Automation & Technology Divisions

- (A) Analysis*
- (C) Robotics & Expert Systems
- (D) Computer Technology*
- (E) Open Systems Interconnection
- (H) Process Measurement & Control*
- (I) Maintenance
- (J) Test Measurement*
- (M) Automatic Control Systems*
- (N) Telemetry & Communications
- (P) Electro-optics
- (W) Management*

Industries & Sciences Divisions

- (B) Aerospace Industries*
- (F) Mining & Metals
- (G) Chemical & Petroleum Industries*
- (K) Construction and Design*
- (L) Pulp & Paper Industry*
- (O) Power Industry*
- (R) Food & Pharmaceutical Industries*
- (T) Textile Industry
- (U) Automotive & Vehicular
- (X) Water & Wastewater Industries
- (Y) Glass & Ceramics Industries
- (Z) Marketing & Sales*

* Students are entitled to one free membership each in the Automation & Technology and Industries & Sciences Divisions. Please choose and mark from the asterisked selections.

USERS DIRECTORY

This index lists manufacturers and trade-names alphabetically and enables users to determine the local representative for a particular manufacturer or product.

Manufacturer / Tradename

3 P
 3-D
 3M Circuit Tracer Kit
 A.H. Emery
 A.S.I.
 A.W. Sperry
 ACR Systems
 AD Technologies
 ADI
 AEM Systems
 AEMC
 AFE
 AFE Technologies Inc.
 APACS
 API Meters
 ARO
 ARi
 ASCO
 ASCO
 ASCO
 ASD
 Accutech
 Acromag
 Acrotech
 Action
 Action Instruments
 Action Instruments
 Action Instruments
 Advance Products Spray Shields
 Agar
 AiRanger
 Air Flow
 Air Monitor Corp.
 Aladco Nu-Check Valves
 Alltemp Sensor RTO/TC/Wells
 Alnor
 Alnor Instruments
 Altek
 Altek
 American
 Ametek
 Ametek
 Ametek - Analyzers
 Ametek Gauges
 Amiad
 Amot
 Amot Controls
 Amprobe
 Analogic
 Anderson Greenwood
 Annubar/DSC
 Apical Charts
 Apollo
 Appalachian Controls
 Armatek
 Armstrong
 Armtec Industries
 Ascoelectric
 Ashcroft
 Ashcroft
 Ashford Valve
 Astro
 Atkins
 Atlantic Group Inc.
 Atomac Ball & Check Valves

Local Sales Representative

Romatec
 Alpha Controls & Instrumentation
 Transcat
 Syber Systems Inc.
 Westburne Lytle
 Transcat
 Alpha Controls & Instrumentation
 Durham Instruments
 Cancoppas Limited
 Prosigma Analytics Inc.
 Transcat
 Axiom Technologies Ltd.
 CTH Industrial Controls
 Moore Products Co. (Canada) Inc.
 Lisle-Matrix Ltd.
 Great Lakes Industrial Controls
 Alpha Controls & Instrumentation
 Tubetech Ltd.
 WESCO
 Westburne Lytle
 Brian Controls
 Brian Controls
 Willer Engineering
 Transcat
 Summit Controls Ltd.
 CTH Industrial Controls
 Cambridge Controls
 Heaters Controls & Sensors Ltd.
 Sarnia Piping Specialties
 Zirco Ltd.
 Millitronics Limited
 Transcat
 Westech Industrial Ltd.
 Provincial Controls
 Tubetech Ltd.
 Baker Instruments Ltd.
 Transcat
 Alpha Controls & Instrumentation
 Transcat
 Axiom Technologies Ltd.
 Brian Controls
 Transcat
 Westech Industrial Ltd.
 Hardie Industrial Services Inc.
 Floval Equipment Ltd.
 Great Lakes Industrial Controls
 Controls
 Transcat
 Transcat
 Cantech Controls
 Floval Equipment Ltd.
 Provincial Controls
 Romatec
 Controls
 Armatek Controls
 Willer Engineering
 BEP Bestobell Canada Ltd.
 Floval Equipment Ltd.
 Romatec
 Transcat
 BEP Bestobell Canada Ltd.
 Prosigma Analytics Inc.
 Transcat
 Controls
 Sarnia Piping Specialties

Manufacturer / Tradename

Aurora
Autotech
Azonix
B & K
B.N.W.
BEHA
BEL
BJ Software
BLH Electronics
BOILER-GARD
BOMEM
BS & B
BTG Inc.
BTG Polymetron
Babbitt
Bacharach - Hand Held Instruments
Backos
Badger Meter
Badger Meter
Bailey
Bailey/Fischer & Porter
Baldwin Environmental Inc.
Balluff
Balston Filters
Barber-Colman
Barksdale
Barnant
Barnant
Barton
Baumann
Beacon Electronics
Beamex
Bebco Industries
Beckman Industrial
Bellofram
Benke
Bestobell Steam, Div. of Richards Ind.
Bestobell Valves
Beta
Beta
Bi-Lok Fittings
Biccotest
Biddle
Bin-Master
Binmaster
Bio-Tek
Bodenseewerk/Perkin Elmer
Bourdon-Sedeme (Manobourdon) Gauges
Brandt
Branson
Bristol Babcock
Brooklyn Thermometer
Brooks
Burkert
Burling Instruments
CEWE
CRL
CSI - Microloggers
Cajon Pipe Fittings
Cal
California Analytical
Can-Ross
Cantech Systems
Carle Chromatography
Cash-Acme
Cashco Canada
Cashco Canada, Inc.
Castell Interlocks
Cellex
Cellex
Celtek Electronics
Cemco

Local Sales Representative

Great Lakes Industrial Controls
Davis Controls
Transcat
Transcat
Floval Equipment Ltd.
Transcat
Willer Engineering
Davis Controls
CB Engineering
Lisle-Matrix Ltd.
Prosigma Analytics Inc.
Romatec
Summit Controls Ltd.
Prosigma Analytics Inc.
Industrial Technical Services
Transcat
Great Lakes Industrial Controls
J & M Engineering & Sales Ltd.
Summit Controls Ltd.
Tubetech Ltd.
Tubetech Ltd.
Novatech
Davis Controls
Sarnia Piping Specialties
Davis Controls
Tubetech Ltd.
Heaters Controls & Sensors Ltd.
Transcat
Armatek Controls
Lakeside Process Controls
R.A. Kirby Sales Inc.
Transcat
Cantrols
Transcat
Romatec
Westech Industrial Ltd.
BEP Bestobell Canada Ltd.
BEP Bestobell Canada Ltd.
Armatek Controls
Transcat
Sarnia Piping Specialties
Transcat
Transcat
Regional Process Equipment
Cancoppas Limited
Transcat
CEM Specialties Inc.
Sarnia Piping Specialties
Willer Engineering
Transcat
Sharp Valve & Instrumentation
Transcat
Great Lakes Industrial Controls
Summit Controls Ltd.
Baker Instruments Ltd.
Cancoppas Limited
Cancoppas Limited
Campbell Scientific (Canada) Corp.
Huron Valve & Fittings
Davis Controls
Brian Controls
Spec Sarnia Limited
Cantech Controls
R.A. Kirby Sales Inc.
Westburne Lytle
Provincial Controls
Cambridge Controls
Great Lakes Industrial Controls
Armatek Controls
Spec Sarnia Limited
Cantrols
Cantech Controls

Manufacturer / Tradename

Century Instrument
Century Valve
Cerabar
Chandler
Chatam Controls
Checkpoint Systems
Chemical Systems
Chemline
Chemtrol
Chemtrol
Chessel
Chessel
Clif Mock
Colder
CompuFlo III
Computer Keyboard Systems (CKS)
Con-Tek
Conant Controls Inc.
Conant Valves
Conders
ConneXt
Consolidated
Consolidated Controls
Control Instruments Corp.
Control Microsystems
Controlair
Controlair Inc.
Cooper Instruments
Cosa
Cosa
Crowcon
Crowcon Gas Detection
Custom Control Sensors
Cutler-Hammer
Cybex
DATATEST
DGH
DPL Plus
Dahl
Danaher Controls
Danfoss
Danfoss Mfg. Co. Ltd. - Denmark
Daniel Industries
Data Industrial Corporation
Data Precision
Datel
Davis Instruments
DeZurik
Defelsko
Delavan
Delphian
Delta F Corporation
Delta-M
Deltabar
Deltacon
Deltapilot
Deltavalve
Detector Electronics (Dettronics)
Devar
DewPro
Dewrance
Dianachart
Dickson
Digitec
Digitec
Dixson Inc.
Dopak
Dover Gas Technologies
Dow Plastic Lined Piping Products
Drainall
Druck
Ducon Environmental Systems

Local Sales Representative

Sarnia Piping Specialties
Brian Controls
Endress + Hauser
Transcat
Heaters Controls & Sensors Ltd.
Cantech Controls
R.A. Kirby Sales Inc.
Floval Equipment Ltd.
U & I Supply
WESCO
TubeTech Ltd.
Willer Engineering
Westburne Lytle
Davis Controls
Milltronics Limited
CB Engineering
Lakeside Process Controls
Industrial Projects Ltd.
Provincial Controls
Transcat
CTH Industrial Controls
Contro Valve Inc.
Transcat
Willer Engineering
Brian Controls
WESCO
Cambridge Controls
Transcat
Brian Controls
Industrial Technical Services
Cancoppas Limited
Regional Process Equipment
Willer Engineering
WESCO
CB Engineering
R.A. Kirby Sales Inc.
Alpha Controls & Instrumentation
Milltronics Limited
Armatek Controls
J & M Engineering & Sales Ltd.
Davis Controls
Lisle-Matrix Ltd.
Canrols
Cambridge Controls
Transcat
Transcat
Transcat
Floval Equipment Ltd.
Transcat
Armatek Controls
Romatec
Prosigma Analytics Inc.
Brian Controls
Endress + Hauser
CTH Industrial Controls
Endress + Hauser
Summit Controls Ltd.
CB Engineering
Cantech Controls
Endress + Hauser
Contro Valve Inc.
Alpha Controls & Instrumentation
Transcat
Brian Controls
Durham Instruments
CTH Industrial Controls
Westburne Lytle
Veronics
Sarnia Piping Specialties
Great Lakes Industrial Controls
Transcat
R.A. Kirby Sales Inc.

Manufacturer / Tradename

Durakool
Duro-Sense
Dwyer
Dwyer
Dwyer
Dwyer
Dwyer DP Gauges/Switches
Dylon
Dynapar
E.G. & G. Chandler
ECD
ECD
ECOM America Ltd.
EG & G Berthold
EG & G Flow Technology Inc.
EIT
EMCO
ENU
ETC
Eagle Signal
Eaton IDT
EchoMax
Echotel Ultrasonic
El-O-Matic
Elasto-Valve
Eldridge
Electromatic
Electromatic
Elremco Timers - England
Elsag Bailey
Elsag Bailey Analytical Division
Enardo
Encoder
Endress + Hauser
Enerrol Shock Absorbers
Enerrols
Engineered Valves International (E.V.I.)
Enraf Inc.
Environmental Technologies Group Inc.
Epic
Erdco
Erhard Valves - Germany
Ernst Flow & Level
Euchner
Eurotherm
Eurotron
Exergen
Exotherm
Expertune
Expo Safety Systems
F.B. Leopold - USA
F.W. Bell
F.W. Murphy
FCI
FPP
FUJI
Fairchild
Farris
Farris Relief Valves
Fieldview
Fike
Fike Canada Inc.
Fischer & Porter
Fischer & Porter
Fisher Controls
Fisher Research
Fisher Service
Fisher-Rosemount Systems
Flow Meter Co. - England
Flow Research
Flow-Tek
Flowdata Inc.

Local Sales Representative

Davis Controls
Transcat
Baker Instruments Ltd.
Cantech Controls
Davis Controls
Transcat
Provincial Controls
Great Lakes Industrial Controls
Davis Controls
R.A. Kirby Sales Inc.
Novatech
Transcat
R.A. Kirby Sales Inc.
Westech Industrial Ltd.
CB Engineering
Novatech
Davis Controls
Durham Instruments
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Davis Controls
Cantech Controls
Milltronics Limited
Provincial Controls
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WESCO
Cancoppas Limited
Davis Controls
Heaters Controls & Sensors Ltd.
Lisle-Matrix Ltd.
Tubetech Ltd.
Prosigma Analytics Inc.
Zirco Ltd.
Axiom Technologies Ltd.
Regional Process Equipment
Provincial Controls
Axiom Technologies Ltd.
Westburne Lytle
Willer Engineering
Novatech
Cancoppas Limited
BEP Bestobell Canada Ltd.
Lisle-Matrix Ltd.
Provincial Controls
Davis Controls
Heaters Controls & Sensors Ltd.
Industrial Technical Services
Heaters Controls & Sensors Ltd.
Heaters Controls & Sensors Ltd.
Summit Controls Ltd.
Syber Systems Inc.
Lisle-Matrix Ltd.
Transcat
Cantech Controls
Willer Engineering
Cancoppas Limited
Heaters Controls & Sensors Ltd.
Regional Process Equipment
Flovial Equipment Ltd.
Provincial Controls
Lakeside Process Controls
Sharp Valve & Instrumentation
Brian Controls
Elsag Bailey
TubeTech Ltd.
Lakeside Process Control
Transcat
Lakeside Process Controls
Lakeside Process Controls
Lisle-Matrix Ltd.
Flovial Equipment Ltd.
Summit Controls Ltd.
J & M Engineering & Sales Ltd.

Manufacturer / Tradename

Fluid Data/Amscor
 Fluke
 Foxboro
 Foxcroft
 Fuji
 Fuji Electric
 Fulier
 G.H. Flow
 G.W. Dahl
 GASCO
 GGOSCO Needle Valves
 GGOSCO Valves
 GO Regulators
 GO Switch (Proximity)
 GPE
 Galtek
 Gamma Silometer
 Gastech Instruments
 Gems Sensors
 General Eastern
 General Resistance
 Geokon
 George Fischer +GF+
 Global
 Graham Manufacturing
 Gralab
 Granucor
 Granuflow
 Granumet
 Graseby / STI
 Great Plains Industries
 Greyline Instruments
 H.D. Baumann
 HCS
 Hach
 Hancock
 Hansen Quik Connects
 Hardy Instruments
 Hartman-Technica
 Hartmann & Braun
 Hathaway
 Hathaway-Wodex
 Haven
 Haws
 Hayward
 Hayward
 Hedland
 Hedland Flowmeters
 Heise
 Hewlett Packard
 Hex Valve
 Hiltap Couplers
 Hiltcroft
 Hitachi - Oscilloscopes
 Hoffer Flow Controls - USA
 Honeywell
 Honeywell
 Honeywell - Recorders
 Honeywell Controllers & Recorders
 Horiba
 Houston Atlas
 Huntron
 Hy-Cal
 HydroGuard
 IBM Industrial Computers
 ICI
 IDEC
 IET
 IMS
 ISI
 ITT Barton Instruments
 ITT Conoflow Regulators & Seals

Local Sales Representative

Armatek Controls
 Transcat
 Spec Sarnia Limited
 Cancoppas Limited
 Industrial Technical Services
 WESCO
 Syber Systems Inc.
 Cantech Controls
 Armatek Controls
 Novatech
 Westburne Lytle
 Hardie Industrial Services Inc.
 Sarnia Piping Specialties
 Lakeside Process Control
 Sharp Valve & Instrumentation
 Romatec
 Endress + Hauser
 R.A. Kirby Sales Inc.
 IMO Industries
 Willer Engineering
 Transcat
 Campbell Scientific (Canada) Corp.
 Brian Controls
 Transcat
 Lakeside Process Controls
 Transcat
 Endress + Hauser
 Endress + Hauser
 Endress + Hauser
 CB Engineering
 Armatek Controls
 Cantrols
 Lakeside Process Controls
 Great Lakes Industrial Controls
 Fryston Canada Inc.
 Contro Valve Inc.
 Provincial Controls
 CTH Industrial Controls
 Transcat
 TubeTech Ltd.
 Armatek Controls
 Alpha Controls & Instrumentation
 Cancoppas Limited
 Great Lakes Industrial Controls
 CTH Industrial Controls
 Summit Controls Ltd.
 Brian Controls
 R.A. Kirby Sales Inc.
 Transcat
 Transcat
 Sharp Valve & Instrumentation
 U & I Supply
 Syber Systems Inc.
 Transcat
 Lisle-Matrix Ltd.
 Brian Controls
 Davis Controls
 Transcat
 Provincial Controls
 Alpha Controls & Instrumentation
 R.A. Kirby Sales Inc.
 Transcat
 Davis Controls
 Endress + Hauser
 CB Engineering
 Cancoppas Limited
 Axiom Technologies Ltd.
 Transcat
 Great Lakes Industrial Controls
 Heaters Controls & Sensors Ltd.
 Armatek Controls
 Sarnia Piping Specialties

Manufacturer / Tradename

ITT Engineered Valves
ITT Neo-Dyn Switches
IVO Industries - USA
Illinois Instruments
Imperial Eastman
Imperial Eastman
Imperial Eastman Fittings
Industrial Scientific
Industrial Sensors
Innovative Sensors Inc.
Inor
Intellution
Intempco
Interface
Interface
International Sensor Technology
Ion Track Instrumentation (ITI)
Ionics Instrument Division
Iotron
Ircan
Isolok
J-Tec
J.M. Canty, Inc.
J.U.M.
JB Engineering
Jacoby Tarbox
Jensen
Jerguson Level Gauges
Jofra
Johnson Yokogawa
Jordan Controls, Inc.
Julius Bauser - Germany
K-Tek
KDG Mobrey
KEP
KF Industries
KL Flow
KNF Neuberger
KTM
Kammer Control Valves
Kammer Control Valves
Kane-May
Kates
Kay Ray/Sensall
Kaye
Kaye Instruments
Keddco Mfg Ltd.
Keller
Kenmac
Kenwood USA
Ketema
Kinetrol Actuators
Kinetrol Actuators
King Instrument Company
King Valves
Kipp & Zonen
Klinger
Klinger
Kobold
Kobold
Koch
Kotron Capacitance
Krebs Engineer
Kreyenborg
Krohne
Kurz
Kurz
L & J Technologies
L.J. Star Inc.
LAGCO Flumes - USA
LC Meters
LCI-Luwa

Local Sales Representative

Romatec
Sarnia Piping Specialties
Lisle-Metrix Ltd.
Veronics
Axiom Technologies Ltd.
U & I Supply
Provincial Controls
Brian Controls
Heaters Controls & Sensors Ltd.
Prosigma Analytics Inc.
Alpha Controls & Instrumentation
CB Engineering
Cantech Controls
Durham Instruments
Willer Engineering
Industrial Projects Ltd.
BEP Bestobell Canada Ltd.
Veronics
WESCO
Willer Engineering
Great Lakes Industrial Controls
Brian Controls
Cambridge Controls
Industrial Technical Services
Transcat
Romatec
Transcat
Romatec
Transcat
CB Engineering
Cambridge Controls
Lisle-Metrix Ltd.
CB Engineering
BEP Bestobell Canada Ltd.
Brian Controls
Great Lakes Industrial Controls
Cancoppas Limited
Transcat
Regional Process Equipment
Cantrols
Westburne Lytle
Transcat
Westech Industrial Ltd.
Rosemount Instruments
Transcat
CB Engineering
U & I Supply
Campbell Scientific (Canada) Corp.
Great Lakes Industrial Controls
Transcat
Brian Controls
Hardie Industrial Services Inc.
Provincial Controls
Industrial Projects Ltd.
Zirco Ltd.
Durham Instruments
Davis Controls
Spec Sarnia Limited
Cancoppas Limited
Regional Process Equipment
Romatec
Provincial Controls
Flovial Equipment Ltd.
Great Lakes Industrial Controls
Moore Products Co. (Canada) Inc.
Brian Controls
Transcat
Sharp Valve & Instrumentation
J & M Engineering & Sales Ltd.
Lisle-Metrix Ltd.
Spec Sarnia Limited
Great Lakes Industrial Controls

Manufacturer / Tradename

LEOPOLD
LFE Instruments - USA
LI-COR
LMI
LMI
Land
Larad
Laurence
Leader
Leaderline
Lee-Dickens Ltd. - England
Legris
Leine & Linde
Lenord + Bauer
Leslie
Lewis
Limitorque
Liquid-O-Ring
Liquiphant
Logic Beach
Love
Lucas Novasensor
Lumenite Electronic Company
M & C Products
M point
M-Tek
M.T.S.
MCS
MDA Scientific
MDI
MKS
MTL
MTL Intrinsic Safe Barriers
MacWeld
Madison
Madur Electronics
Magnetrol
Magnetrol Level & Flow
Maihak
Major
Manobourdon
Marine Moisture Co.
Martel
Masoneilan
Massa
Max
McCrometer
Mead
Measurement Systems
Meeco Inc.
Mercoid
Meriam Instruments
Meriam Instrumnets
Mesa Laboratories
Met One
Metrix
Metrix Timers
Mettler Toledo
Micon
Micro Motion
Micro Wire
MicroRanger
Micronics Ltd.
Micropilot
Mid-West Instrument
Mid-West Instrument
Mihjets
Mikron
MillFlo
Milltronics
Milton Roy - Liquid Metronics Division
Milwaukee

Local Sales Representative

Lisle-Metrix Ltd.
Lisle-Metrix Ltd.
Campbell Scientific (Canada) Corp.
Novatech
U & I Supply
Transcat
Syber Systems Inc.
Great Lakes Industrial Controls
Transcat
Honeywell
Lisle-Metrix Ltd.
Axiom Technologies Ltd.
Durham Instruments
CTH Industrial Controls
Great Lakes Industrial Controls
Transcat
Sharp Valve & Instrumentation
Great Lakes Industrial Controls
Endress + Hauser
Durham Instruments
Davis Controls
Durham Instruments
J & M Engineering & Sales Ltd.
CEM Specialties Inc.
Endress + Hauser
Transcat
R.A. Kirby Sales Inc.
Heaters Controls & Sensors Ltd.
Westech Industrial Ltd.
Heaters Controls & Sensors Ltd.
Transcat
Syber Systems Inc.
Provincial Controls
Heaters Controls & Sensors Ltd.
BEP Bestobell Canada Ltd.
Novatech
Flovat Equipment Ltd.
Provincial Controls
Westech Industrial Ltd.
Alpha Controls & Instrumentation
Sarnia Piping Specialties
R.A. Kirby Sales Inc.
Transcat
Contro Valve Inc.
Durham Instruments
Willer Engineering
Brian Controls
Transcat
Durham Instruments
Novatech
Davis Controls
Transcat
Brian Controls
Brian Controls
Armatek Controls
Campbell Scientific (Canada) Corp.
Transcat
Lisle-Metrix Ltd.
Westech Industrial Ltd.
Cantech Controls
Rosemount Instruments
Spec Sarnia Limited
Milltronics Limited
Veronics
Endress + Hauser
Brian Controls
Hardie Industrial Services Inc.
Spec Sarnia Limited
Transcat
Milltronics Limited
Milltronics Limited
U & I Supply
Flovat Equipment Ltd.

Manufacturer / Tradename

Mini-X Purge Systems
Mini-Z Purge Systems
MiniRanger Plus
Mitac
Mitsubishi
Mobrey
Molecular Analytics LLC
Monarch
Monitek
Monitor Labs
Monitor Labs
Moore
Moore Industries
Moore Products Pressure Regulators
Mueller
Multi-Amp
Multi-Volt
MultiRanger Plus
Multicap
Multiglass
Mycro
Myron L
NBS
NGI
NICE
Nassau Instrument
Neles-Jamesbury
Neotronics
Neotronics
Nil-Cor
Nivocompact
Nivosonic
Norriseal Butterfly Valves
Norstat
Northern Vibrator
Noshok
Novatech Engineering Group
Numatics
Numatics Cylinders
Numatics F/R/Ls
Numatics Solenoid Valves
Nupro Valves
Nusonics
O'Brien Corporation
OCM III
OSI Semitronic
Oakton
Ogden
Ogden
Ogontz
Oilgear
Oldham
Oliver Valves
Omron
Optek
Orange Research DP Switch
Orion
PCME
PGI
PGI Valves & Manifolds
PMV
PMV
PTC
Pacer Industries
Pamark Manifolds
Panalarm
Panalarm
Panametrics PCI Division
Papailias
Parker Hannifin
Partlow
Paul Mueller

Local Sales Representative

Syber Systems Inc.
Syber Systems Inc.
Milltronics Limited
CTH Industrial Controls
Davis Controls
BEP Bestobell Canada Ltd.
Novatech
Transcat
Willer Engineering
Brian Controls
Romatec
Moore Products Co. (Canada) Inc.
Armatek Controls
Transcat
Great Lakes Industrial Controls
Transcat
Transcat
Milltronics Limited
Endress + Hauser
Great Lakes Industrial Controls
Moore Products Co. (Canada) Inc.
Transcat
Transcat
Transcat
Cancoppas Limited
Transcat
Summit Controls Ltd.
Cantech Controls
Transcat
Contro Valve Inc.
Endress + Hauser
Endress + Hauser
Sarnia Piping Specialties
Davis Controls
Flovat Equipment Ltd.
IMO Industries
Novatech
Axiom Technologies Ltd.
Provincial Controls
Provincial Controls
Provincial Controls
Huron Valve & Fittings
Armatek Controls
CB Engineering
Milltronics Limited
CTH Industrial Controls
Transcat
Durham Instruments
Heaters Controls & Sensors Ltd.
Cantech Controls
BEP Bestobell Canada Ltd.
Cantech Controls
Sarnia Piping Specialties
Axiom Technologies Ltd.
R.A. Kirby Sales Inc.
Provincial Controls
Transcat
Westech Industrial Ltd.
Regional Process Equipment
Provincial Controls
Cancoppas Limited
Regional Process Equipment
Transcat
Transcat
Provincial Controls
Cambridge Controls
Willer Engineering
Veronics
Great Lakes Industrial Controls
Tubetech Ltd.
WESCO
Great Lakes Industrial Controls

Manufacturer / Tradename

Pelican
 Penberthy
 Penberthy Instruments
 Penny & Giles
 Penny + Giles

Local Sales Representative

Transcat
 Brian Controls
 Hardie Industrial Services Inc.
 Cantech Controls
 Durham Instruments

Manufacturer / Tradename

Stonel
 Strahman
 Sugino
 Superior
 Swagelok Tube Fittings
 Syscon
 Systematix
 T.B. Woods
 TA Instruments
 TBI
 TBI-Bailey
 TBV
 TDC-3000
 TIF
 TLV
 TSI
 Tapecoat Canada
 Tate-Andale
 Taylor Hand Actuated Pressure Calibrator
 Techmation
 Techne
 Technipower
 Tegam
 Tektronix
 Tel-Tru
 Tel-Tru
 Tel-Tru Thermometers
 Teledyne Analytical
 Teledyne Combustion Efficiency Analyzer
 Teledyne-Farris Relief Valves
 Telegan
 Telematic
 Tempco
 Tenor Industrial Control
 Testo Inc.
 Testoterm
 Texas Electronics - Raingauges
 Texas Sampling
 Texas Sampling Inc.
 The Electron Machine Corporation
 The Probe
 Theben
 Thermal Instrument Co.
 Thermo Electric
 Thermo Electric - Calibrators
 Thermo-Kinetics Temperature Products
 Thermon
 Thermox
 Time Electronics
 Tomoe Valves
 Torbar Flowmeters Ltd.
 Tour & Anderson
 Tower-Gard
 Transmation
 Transmation
 Transtector Systems
 Trend B-Metal Thermometers
 Trerice
 Tricentric
 Tripp-Lite
 Tritron
 Tuffline Valve
 Turbo
 Tytronics Inc.

Local Sales Representative

Summit Controls Ltd.
 Regional Process Equipment
 Cantech Controls
 Axiom Technologies Ltd.
 Great Lakes Industrial Controls
 Huron Valve & Fittings
 Heaters Controls & Sensors Ltd.
 Willer Engineering
 Axiom Technologies Ltd.
 Westech Industrial Ltd.
 TubeTech Ltd.
 Eltag Bailey
 Romatec
 Honeywell
 Transcat
 TubeTech Ltd.
 Willer Engineering
 Sarnia Piping Specialties
 Great Lakes Industrial Controls
 Transcat
 Lakeside Process Control
 Transcat
 Transcat
 Transcat
 Transcat
 Brian Controls
 Transcat
 Hardie Industrial Services Inc.
 Armatek Controls
 Transcat
 Provincial Controls
 BEP Bestobell Canada Ltd.
 Willer Engineering
 Heaters Controls & Sensors Ltd.
 Heaters Controls & Sensors Ltd.
 Baker Instruments Ltd.
 Transcat
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 Cantrols
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 Cantech Controls
 Provincial Controls
 Great Lakes Industrial Controls
 Westburne Lytle
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 Regional Process Equipment
 WESCO
 Novatech

Manufacturer / Tradename

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Vaccon Vacuum Products
Vaisala
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Valhalla
Validyne
Valtek Controls
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Veeder-Root
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Wallace & Tiernan
Wallace & Tiernan - Pressure Calibrators
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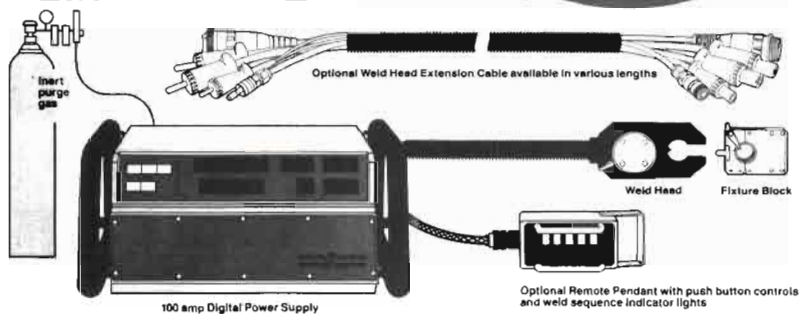
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