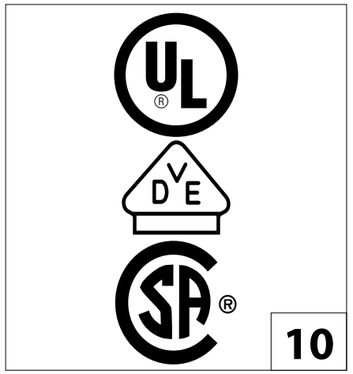
INTER POWERSOURCE

SUMMER/FALL 2012 | ISSUE 4

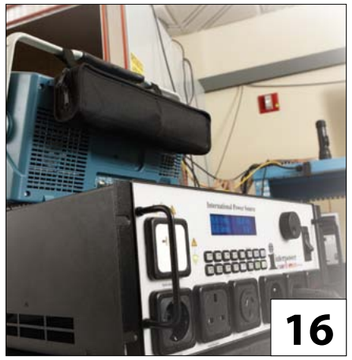
AC Power Sources pg 16

PLUS:

6



10



16

POWERSOURCE

SUMMER/FALL 2012 | ISSUE 4

COVER STORY

FEATURES

DEPARTMENTS

ON THE COVER

The cover shows the IPS (AC International Power Source). AC power sources offer low cost sources of power at various voltages and frequencies found around the world. Contact our Customer Service Department to inquire about our IPS at: **sales@interpower.com**

EMPLOYEE FOCUS

Dan Beeler

Dan Beeler is our IPS (International Power Source) Technician. His primary responsibilities are producing and documenting the development of our newest product, the IPS. Dan has documented the design changes and failures; creating a history that can be utilized for troubleshooting and preventative action. He also provides technical and application support on IPS units to both our external and internal customers. In addition, Dan maintains the equipment for IPS assembly area according to the preventative maintenance program and performs trouble shooting of an electrical, electronic, and mechanical nature if needed.

In addition to all of the IPS work, Dan conducts monthly generator and transfer switch testing, and monthly building and equipment inspections.

Dan enjoys the different challenges and that each day he gets to learn and experience something new. Most recently, Dan was able to travel to Philadelphia to test the IPS. He was able to visit Valley Forge, see the Liberty Bell and eat at Geno's, known worldwide for their Philadelphia cheese-steak sandwiches.

Prior to joining Interpower Corporation, Dan earned his Associate's Degree in Electronics, held a position at Sundstrand, and for 20 years owned his own electronics parts business in Ames, IA. In his free time, Dan enjoys spending time with his wife Deb and his boys, Michael and Steven. He also enjoys the outdoors and hunting.

Putting the Pieces Together

By Hannah Pothoven

At Interpower Corporation, we offer made-to-order services. This includes custom labeling and packaging, custom length cords, cable terminations, and more. Our manufacturing lead time is 1-week for custom Interpower manufactured cords. We aim to delight our customers by shipping orders as soon as possible. Following is an example of Interpower team members working together to process, manufacture and ship an order in less than 1-week.

Interpower Corporation's Customer Service Department received a purchase order on January 17th for 25 pieces of a custom made-to-order cord set. On January 19th, the customer sent an email to check the status of their order and see if we could ship one piece immediately to save a large order from their end customer. The Customer Service Representative worked with the Made-To-Order Manufacturing Scheduler to expedite the order. The Interpower Shipping Department was able to ship one piece on January 19th via overnight service, and the remainder of the order was shipped on January 20th.

Due to the great teamwork between the Customer Service, Manufacturing and Shipping Departments, this custom order was placed and shipped in just three days! Not only was Interpower Corporation able to go above and beyond its promise and delight our customer, but in turn our customer was able to meet their requirements and delight their end customer.

With Interpower Corporation's dedication to teamwork, we are putting the pieces together from Customer Service, to Manufacturing, to Shipping and beyond!

INTERPOWER SOURCE

Editor in Chief
Bob Wersen

Writers
Kari DeBruin
Hannah Pothoven
Rob Taylor
Ralph Bright
Dan Beeler
Jana Brown-Watts

Photographers
Hannah Pothoven

Design
Amelia McGrath

Contributors
Hannah Pothoven
Judy Nunnikhoven
Pat Moore
Ron Barnett
Wendy Meyer
Dan Ford
Joe Caligiuri

Publisher
Interpower Corporation

Address
P.O. Box 115
Oskaloosa, IA 52577

Fax
800.409.0082

E-mail
info@interpower.com

InterPower Source Magazine is published quarterly by Interpower Corporation P.O. Box 115 Oskaloosa, IA 52577. Issue 4, Summer/Fall 2012.

Periodicals postage paid in Ames, Iowa and additional mailing offices. **Postmaster:** Send change of address to: Interpower Corporation, 2900 SE 5th Street, Ames, IA 50010.

For subscription information:
Subscribe online at http://www.interpower.com/join, provide your name and address by fax 800.409.0082 or email info@interpower.com, or mail your information to Interpower

Today's customer expects to remove an electronic product from its shipping container, plug it in, and start using it immediately. The days when the customer would be willing to cut off a power plug and wire on a locally acceptable alternative and then make changes to the internal wiring to accommodate local mains voltages and frequencies are past. The article on AC Power Sources beginning on page 17 describes an easy-to-use power source that is set up for use anywhere in the world to test products going anywhere else in the world.
How valuable is that?

Check out our continuing series titled, 21 Plug Standards…and Counting starting on page 6 for a summary of requirements for North American plugs. There are a large number of variations of these plugs and they are described in the article.

We start a look at the International Testing Agencies in an article starting on page 10 and on pages 14 and 15, we provide a chart showing the symbols of more than 30 international test agencies.

This edition of Interpower Source Magazine contains a primer on EMC beginning on page 20 and a brief article on an EMI Testing Chamber on page 23.

Finally, we offer short articles on the History of ISO on page 22 and an update on how IEC 60320 is evolving on page 4.

These articles are all designed to assist you in understanding international standards and how you can incorporate them into your designs as you create and manufacture electrical products for global sale.

Best regards,

Bob Wersen, President

NEW Proposed IEC 60320-3 Standard

By Rob Taylor

The IEC SC23G committee under the umbrella of the International Electrotechnical Commission (IEC) is currently discussing a new standard; one that just may affect you and your products.

The IEC 60320 family of standards covers appliance couplers. The proposed 60320-3 standard is the result of Maintenance Team 60320-1's work to combine the constructional and performance requirements in IEC 60320-1 (for connectors and inlets, e.g. C13 and C14) with IEC 60320-2-2 (interconnection couplers … specifically the plug connectors and outlets, e.g. Sheet E and Sheet F). Technically, IEC 60320-1 is the base standard for all appliance couplers. The IEC 60320-2-2 interconnection couplers are a subset of the appliance couplers family. So, combining these standards into one document simplifies the constructional and performance requirements across the entire family. The proposed 60320-3 standard therefore combines all the appliance connector, inlet, and plug connector and outlet dimensional requirements in drawings from both the 60320-1 and 60320-2-2 standards into one standard.

The scope of the IEC 60320-1 is focused on the appliance connector of a cord set and the appliance inlet the connector connects with. (Figure 1 & Figure 2)

Figure 1: C13 Connector

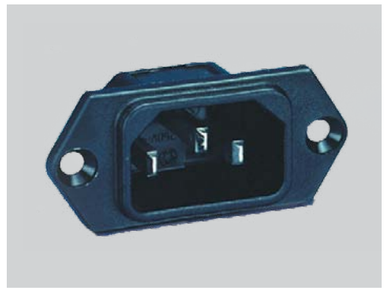


Figure 2: C14 Inlet

Specifically the standard states: "This part of IEC 60320 is applicable to two-pole appliance couplers for a.c. only, with or without earthing contact, with a rated voltage not exceeding 250 V and a rated current not exceeding 16 A, for household and similar general purposes and intended for the connection of a supply cord to electrical appliances or other electrical equipment for 50 Hz or 60 Hz supply." While the new IEC 60320-3 is still in the "new proposal stage" in the IEC SC23G group, it could be published in 1 to 2 years. The IEC SC23G will make the decision and the countries that make up the group have the deciding vote. There are 21 participating countries and 17 observer countries. Some participating countries include the United States, United Kingdom, Germany, China and Canada.

Where can I find more information?
For a full listing you can visit the IEC web site at **http://www.iec.ch**

Info**POWER** *Briefs*

By Hannah Pothoven

Have you been following the InfoPower blog? Recently, we completed the "Power Mains Monday" series. These blog posts were posted the first Monday of every month beginning in March 2011. They covered the 21 standard plug patterns used around the world. Be sure to check them out. They include Continental Europe, Australia, the United Kingdom, Denmark, France and Belgium, India and South Africa, Israel, Italy, Japan, North America, Switzerland, Argentina, China, and Brazil.

There is so much information to know when designing equipment for export. The *InfoPower* blog offers a way to make it easy for you. A series of "Designing for…" blogs has been created to give you information and resources you need when designing for specific countries. We have started a series on international testing agencies, giving insight as to how they started, what their goals are, and more. We also feature blogs on different quality testing that is done.

Do you have a topic that you are interested in getting more information? Email it to: **infopower@interpower.com** and you just might see it as a blog topic.

Letters to the Publisher

InterPower Source welcomes comments from our readers. Letters can be typewritten or e-mailed, and must include the author's full name, address, and telephone number. Address your submission to:

Interpower Corporation
2900 SE 5th St.
Ames, IA 50010

fax: 800-409-0082
e-mail: info@interpower.com

The editors reserve the right to edit letters for clarity, style, and length. We regret that unpublished letters cannot be acknowledged or returned.

You can view our blog at www.interpower.com/ic/infopower-2. For topics not addressed in our blog, please email us at infopower@interpower.com. For urgent needs, please call our Customer Service Department at (800) 662-2290 or email sales@interpower.com. Technical support is free and available from 7 a.m. to 7 p.m. Central Standard Time.

Our fourth in a series of articles covering the 21 standard worldwide plug patterns; this edition covers the North American Plug Standard.

By Kari DeBruin

21 Plug Standards... *and Counting*

WE ARE PLEASED TO BE CONTINUING *the series of articles devoted to describing the 21 standard plug patterns that are currently used throughout the world. In our first edition, we covered the plugs from the Continental European, Euro, UK, India/South Africa. Our second edition highlighted the plugs from Denmark, Argentina, Australia and China. In our third edition, we discussed Brazil, Italy, Japan and Switzerland. In this final installment of the series, we will focus on North America.*

North American Plugs

The North American plugs, connectors, and receptacles are described in standards published by the National Electrical Manufacturer's Association (NEMA) in the United States and by the Canadian Standards Association (CSA) in Canada. The standards identify unique pin and receptacle configurations based on amperage and voltage ratings. Both straight blade and locking configurations are included in the standards. **The chart on page 8 shows some of the different pin configurations.*

You can see that the blade position changes or is a different shape so that the user cannot accidentally plug a 30 amp plug into a 15 amp receptacle. The NEMA 5-15 straight blade configuration is used most often in the US and Canada.

NEMA Nomenclature

The NEMA pattern and numbering system is made up of four main identifiers.

1) The first identifier can be either a blank space or the letter L. This establishes whether it is a straight or locking blade device. For example, a 5-15 plug signifies that the blades are straight, whereas an L5-15 plug denotes that the plug is a locking plug.

2) The second identifier is a number. The first number listed determines the voltage rating. The 5 in a 5-15 corresponds to the voltage rating of 125 VAC, while the 6 in 6-15 identifies a rating of 250 VAC. The rating given is the highest voltage allowed for a device by the standard.

3) The third identifier is a number which distinguishes the amperage rating for the device. A 5-20 has a rating of 20 amps. The amperage rating, like the voltage rating, is the highest amperage allowed for use with the device by the standard.

4) The fourth identifier is a letter. The identifier determines whether the device is a plug (P), or a receptacle/outlet (R). Therefore an L5-15P is a locking, 125 volt, 15 amp plug. A 5-20R is a straight blade, 125 volt, 20 amp receptacle or outlet. If there is no letter on the fourth position, it is assumed the device is a plug*.

Plugs derived from NEMA patterns and standards are also used in Mexico, Japan, parts of Korea, Taiwan, Central America, Colombia, Venezuela, Ecuador and on the west coast of South America. These countries are not obligated to follow or utilize our ratings systems and often don't. The electrical systems in developing countries are usually ungrounded. It is not recommended to cut off the ground pin so that the plug can be mated with a two-pole, ungrounded socket. Doing so can cause an unsafe condition, therefore, it is best to use a two blade plug with a jumper wire that connects the chassis ground to a building ground.

Hospital-Grade

Hospital-grade plugs and sockets are subject to special requirements by UL and CSA. The hospital-grade plugs, connectors, and receptacles are required to be marked with the phrase Hospital Grade and carry the signature "green dot." This dot signifies that the items have been designed and tested for grounding reliability, assembly integrity, strength, and durability. More specifically, it signifies that they meet or exceed the requirements of UL Standard 498 and CAN/CSA 22.2 no 42. Cords are subject to UL 817 and CSA C22.2 no 21. UL 60601-1 refers to patient care equipment and patient vicinity. Currently the UL standard only allows the NEMA 5-15, 5-20, 6-15 and 6-20 straight blade devices to be marked Hospital Grade.

** There are other letters used in industry: FI=Flanged Inlet, FO= Flanged Outlet, C=Cable Connector.*

North American Non-locking NEMA Configurations

Use this chart to determine which general purpose NEMA plug or receptacle is needed for specific applications.

	2 pole 2-wire		2 pole 3-wire grounding			3 pole 3-wire		3 pole 4-wire grounding		4-wire
	125V	250V	125V	250V	277V	125/250V	3ø 250V	125/250V	3ø 250V	3ø 120/208V
15A Receptacle	 1-15R		 5-15R	 6-15R	 7-15R		 11-15R	 14-15R	 15-15R	 18-15R
Plug	 1-15P	 2-15P	 5-15P	 6-15P	 7-15P		 11-15P	 14-15P	 15-15P	 18-15P
20A Receptacle		 2-20R	 5-20R	 6-20R	 7-20R	 10-20R	 11-20R	 14-20R	 15-20R	 18-20R
Plug	 1-20P	 2-20P	 5-20P	 6-20P	 7-20P	 10-20P	 11-20P	 14-20P	 15-20P	 18-20P
30A Receptacle		 2-30R	 5-30R	 6-30R	 7-30R	10-30R	11-30R	14-30R	15-30R	18-30R
Plug	1-30P	2-30P	5-30P	6-30P	7-30P	10-30P	11-30P	14-30P	15-30P	18-30P
50A Receptacle			5-50R	6-50R	7-50R	10-50R	11-50R	14-50R	15-50R	18-50R
Plug			5-50P	6-50P	7-50P	10-50P	11-50P	14-50P	15-50P	18-50P
60A Receptacle								14-60R	15-60R	18-60R
Plug								14-60P	15-60P	18-60P

Information obtained from ANSI/NEMA WD-6 standard. Face and pin sizes not necessarily to scale. For reference only.

Major International Testing Agencies

by Kari DeBruin

This is our first in a series of articles that will discuss the major international testing agencies. We will begin the series with our focus on VDE, CSA, and UL; subsequent articles will explore the smaller agencies.

VDE

What is VDE?

The Association for Electrical, Electronic & Information Technologies, also known as the VDE, is one of the largest technical and scientific associations in Europe. It was originally established in 1879 as the Electrotechnical Society of Germany. In 1893, thirty-seven delegates held a conference and elected the VDE board. Later that year, the VDE held its first annual meeting and established the first technical committee in order to prepare regulations for electrical equipment.

A year later, groups began working on developing regulations for construction, operations, and copper components. In the following years, additional work was done to create standards for a variety of items, including incandescent lamps, sheet iron, and meters. In addition, the first VDE regulation (VDE 0100) was passed.

By 1904, the VDE had developed 17 regulations and compiled them in its first book, Book of Standard Components. A few years later, with the help of member societies and a total of 24 countries, VDE helped found the International Electrotechnical Commission (IEC) in London.

In 1920 a testing center was opened in Berlin. This center tested electrotechnical products according to the VDE regulations of the time. This time period also marked the birth of the VDE mark. In the next several years the ETZ-Verlags (VDE-VERLAG GBH) was formed and the VDE was incorporated into the NS Association of German Technology (NSBDT).

Growth came to an immediate stop however, following the war in 1945. At the time, all associations with the NSBDT were prohibited. However, later, a British appointed trustee was put in place at the headquarters in Berlin and work gradually resumed. In 1950, the VDE was officially re-established and moved to Frankfurt am Main, Germany.

Once the VDE was established in its new home, it went to work founding societies, creating, consolidating work with the DIN, and created the German Commission for Electrical, Electronic & Information Technologies (DKE) in addition to a variety of societies and umbrella organizations.

In the subsequent years, the VDE merged with a variety of societies and associations that expanded its reach and focus. Today, the VDE is supported by 29 branch offices located through Germany, including Berlin and Brussels. At the present, VDE has more than 35,000 members from a variety of backgrounds including science, academic, electrical and information technology.

Primary Goals

One of VDE's main goals is to be innovative and globally competitive by networking experts and technologies, ensuring the continual development and use of technology in various industries. This goal is accomplished by:

- Sharing technical knowledge both nationally and internationally
- Supporting the educating and training of new talent
- Participating in politics concerning education and research
- Sponsoring educational and career development
- Improving public understanding of new technologies
- Ensuring Electrotechnical products sold in Germany (and worldwide) are certified as safe through rigorous testing in the VDE testing institute. Products that receive the VDE Certification mark are recognized as having a guarantee of quality and safety.

Primary Activities

VDE runs five scientific organizations, organizes international technical educational conferences and operates a world renowned testing and certification institute.

Technical and Scientific Societies
- ITG Information Technology Society within VDE
- ETG Power Engineering Society within VDE
- DGBMT German Association of Biomedical Engineering within VDE
- GMM VDE/VDI Society of Microelectronics, Micro and Precision Engineering
- GMA VDI /VDE Society of Measurement and Automation Engineering

Medical Technology
- The VDE is a founding member and manager of the umbrella organization, Medical Technology (DVMT). This organization handles research, development and user-oriented matters in addition to standardization, safety and continuing education in medical technology.

Symposium Service
- The VDE is responsible for organizing international technical educational conferences and seminars.

- **Electrotechnical Standardization**
VDE and the DKE German Commission for Electrical, Electronic & Information Technologies of DIN prepare and promote electrotechnical standards and regulations.

- **Testing and Certification**
The VDE Testing and Certification Institute conducts testing of electrotechnical products, components and systems, and bestows the VDE Certification Mark.

- **Publications**
The VDE publishing house prints the Association's technical and scientific publications, including the series on VDE standards and regulations, specialized electrotechnical books and journals.

- **Technology Promotion**
The VDI /VDE Technology Center for Information Technology provides trend analyses, technologymarketing and consultancy.

For more information, visit **www.vde.com**

Our second major testing agency that we will discuss is CSA.

CSA

What is CSA?

CSA is the Canadian Standards Association. It is a not-for-profit organization that dates back to 1919 under its former name, Canadian Engineering Standards Association (CESA). The organization was birthed from frustration that technical resources were unable to operate together during World War I. Not only was this a nuisance, but it was also the cause of many injuries and deaths. Because of this, Britain asked the Canadian government to develop a standards committee. Sir John Kennedy, the Chairman of the Civil Engineers' Canadian Advisory Committee, undertook the task of addressing the validity of the request. After much debate, Kennedy guided the Canadian government in creating and federally chartering the CESA.

The committee went to work immediately, attending to specific needs of the time: bridges, building construction, electrical work, wire rope and aircraft parts. They worked swiftly, issuing their first standard in 1920, for steel railway bridges.

Seven years later, CESA produced its best selling document, the Canadian Electrical Code. Having these codes meant that they needed to have a place for product testing. In 1933, Hydro-Electric Power Commission of Ontario was responsible for all of the testing in Canada. Later, CESA took on the responsibility for the testing and certification of all electrical products that were sold and installed in Canada. Tests were conducted in their testing labs in Toronto.

In 1944, CESA became the Canadian Standards Association (CSA). In 1946, they introduced the CSA certification mark and by the 1950's, in efforts to expand its scope of testing and certification, CSA had established international alliances in the Netherlands, Britain, and Japan, with additional testing labs added in Montreal, Vancouver, and Winnipeg.

During the 1960s-1980s, CSA expanded its standards to include occupational health and safety standards and increased its participation in consumer standards. In 1984 they established QMI, the Quality Management Institute for registration of ISO9000 and other standards. (CSA also developed the CAN/CSA Z299 series of quality assurance standards, which are an alternative to the ISO 9000 series).

In 1999, CSA decided to make its primary purpose standards development and training and thus established CSA International. By 2001, QMI, CSA and CSA International were all joined under the name CSA Group. In 2004, another division, OnSpeX, was developed. This division provides product performance testing services. More recently, in 2009, CSA purchased SIRA, a UK-based notified body, specializing in ATEX, IECEX and North American product approvals. In 2008, QMI was sold to SAI Global.

Primary Goals

CSA's main goal is to develop standards that meet the needs of their country. CSA has 9,000 members from government, industry, and consumer groups that contribute their time, money and expertise to developing standards. In addition to standard development, CSA meets the needs of their country by providing:

- Print and electronic standards
- Training and e-learning
- Advisory Services
- Services in conjunction with the other CSA group divisions: CSA International, OnSpeX, and SIRA

Primary Activities

CSA works primarily in creating standards in the 57 different areas of specialization within these categories:

- Business & Quality Management
- Construction
- Electrical
- Energy
- Environment & Carbon Management
- Health Care
- Information Technology & Telecommunication
- Infrastructure & Public Works
- Mechanical & Industrial Equipment
- Occupational Health & Safety
- Public & Community Safety

Although most of the standards are voluntary, companies find it beneficial because it shows that their products have been independently tested to meet specific standards for safety and/or performance. The CSA mark can only be applied by those who are licensed or authorized by the CSA. Recently, the CSA has been experiencing problems with counterfeit marks. The problem is of such concern that an anti-counterfeiting initiative has been launched. What is most concerning is that inadequate, unsafe products that may be hazardous appear to have the CSA mark. One sign of a counterfeit CSA marking is that the product is sold for well below its market price.

In addition to domestic standards, CSA is actively involved in international standards groups to create standards that enhance trade, safety, and well being worldwide.

For more information on CSA, visit **www.csa.ca**

Our last testing agency in this article is UL.

UL

What is UL?

Underwriters Laboratories Inc. (UL) is one of the largest independent product safety certification organizations in the world, with approximately 21 billion UL marks present in the global marketplace.

United Laboratories Inc (UL) was established in 1894, by electrical engineer, William Merrill. At that time, Merrill was in Chicago for work, examining the World Fair's Palace of Electricity. After his experiences there, and seeing a great future in the field, he decided to stay in the Chicago area and launch his own company and worked diligently to develop standards and testing procedures. Merrill also designed equipment paying particular attention to any potential hazards. Merrill also served on the National Fire Protection Association as both secretary treasurer (1903-1909) and as president (1910-1912). His command of fire safety helped establish the first UL standard to be published; the standard for tin clad fire doors, in 1903. In 1904, the first UL mark was applied, finding its home on a fire extinguisher. By 1905, UL inspectors were conducting their first factory inspections of UL labeled products and established a Label Service for products that required recurrent inspections. This was the beginning of the signature testing and certification program of UL today. UL continued to grow and expand its influence, and by 1916, Merrill was its first president.

Over the years, UL has continued to progress. Today, the organization has 64 laboratories, testing and certification facilities providing its services to almost 100 countries worldwide. What started as a company devoted to electrical and fire safety, has become a major player in the world devoting itself to safety/testing issues, including the handling and management of hazardous substances, water quality, food safety, performance testing and creating a sustainable environment. UL is approved for such testing by the U.S. federal agency Occupational Safety and Health Administration (OSHA).

In 2007, the UL Board of Trustees decided to create a for-profit certification subsidiary, which promotes the sales of the standards, with the non-profit parent company still developing the safety standards. This addition was led by CFO Michael Saltzman and was a major undertaking and transition for the 113 year old company.

Primary Goals

As previously stated, UL's primary goal is to enhance the safety and the quality of products in the worldwide market. They achieve this goal by developing standards and test procedures for products, materials, components, assemblies, tools and equipment, with primary focus being product safety. They continue their mission by:

- Creating a U.S. safety system that has developed 1,040 product standards and outlines
- Participating in national and international standards development
- Evaluating more than 19,450 types of products
- Ensuring compliance through more than 600,000 inspections each year
- Serving as a safety resource and advocate
- Working alongside a variety of groups on education, research, safety and technology,

Primary Activities

UL works with over 72,000 customers in 99 different countries to help enhance the safety and quality of products. It offers 188 locations throughout the world and the expertise of over 6600 professionals. UL offers the following services:

- National and regional safety certification
- Registration of management systems
- Performance testing
- EMC
- NEBS
- Environmental and public health testing
- Water quality analysis
- Commercial inspection and testing

The standards that UL develops are the product of great discussion and review from a variety of groups, including professionals from the government, industry, insurance groups and consumers. The needs and opinions of these diverse individuals help to create the highly respected standards.

Most UL standards are also recognized as American National Standards (ANSI). These standards are produced and evaluated by the UL Standards Technical Panel (STP). An STP is a collection of individuals from a wide variety of interests that assess UL proposals and address UL Standards-related issues. This assembly is the consensus group that re-examines and votes on proposals preceding the publication of the standards.

UL develops standards for the following 9 categories of equipment:

- Electrical Components
- Electronic Equipment
- Wire and Cable
- Appliances
- Information Technology Equipment
- Fire Protection Equipment
- Fire Suppression Equipment
- Signaling and Alarms
- Equipment for use in Hazardous Locations

UL has published 830 Standards for Safety; with 70 of the standards being harmonized with IEC Standards.

For more information, **visit www.ul.com**

Sources:
"VDE" VDE Verband Der Elektrotechnik Elektronik Informationstechnik E.V. VDE Verband Der Elektrotechnik Elektronik Informationstechnik E.V. Web. 02 June 2012. <http://www.vde.com/>.

"Canadian Standards Association" CSA.CA. Canadian Standards Association. Web. 01 June 2012. <www.csa.ca>.

"United Laboratories Inc." UL.com. United Laboratories Inc. Web. 30 May 2012. <http://www.ul.com/>.

Verband der Elektrotechnik, Elektronik and Informationstechnik e.V. (VDE)

Founded in: 1893
Type of Organization: Technical-Scientific Association
Headquarters: Frankfurt am Main, Germany
Regions Served: Germany
Leadership: Joachim Schneider, President
Staff: 800 people
Members: 35,000+
Website: www.vde.com

Canadian Standards Association (CSA)

Founded in: 1919
Type of Organization: Standards (non-profit)
Headquarters: Mississauga, Ontario, Canada
Regions Served: global marketplace
Leadership: Bonnie Rose, President
Membership: 1200 committees in 3 categories: Volunteer, Associate, Sustaining
Website: www.csa.ca

Underwriters Laboratories Inc (UL)

Founded in: 1894
Type of Organization: Standards (non-profit). Certification (for-profit).
Headquarters: Northbrook, IL, USA
Regions Served: 99 countries throughout the global marketplace
Leadership: Keith Williams, President, CEO & Trustee
Staff: 9800+ people
Website: www.ul.com

Major International Testing Agencies

interpower Group of Companies

USA: P.O. BOX 115, Oskaloosa, IA 52577-0115 (U.S.A.) • Tel: (800) 662-2290 • Fax: (641) 673-5100

UK: 10 Kelvin Drive • Knowlhill, Milton Keynes • Buckinghamshire, UK • MK5 8NH
Tel: +44 (0) 1908 327700 • Fax: +44 (0) 1908 327706

Country	Testing Agency	Agency Logo	Agency Website
Argentina	IRAM		http://www.iram.org.ar/
Australia	NSW Office of Fair Trading	*Fair Trading does not have a logo*	http://www.fairtrading.nsw.gov.au/default.html
Austria	OVE		http://www.ove.at/
Belgium	CEBEC		http://www.be.sgs.com/cebec_index_v2/
Brazil	INMETRO		http://www.inmetro.gov.br/english/
Canada	CSA		http://www.csa-international.org
China	China Quality Certification		http://www.cqc.com.cn
CZECH Republic	Electrotechnical Testing Inst.		http://www.ezu.cz/index.php?lang=en
Denmark	DEMKO		http://www.ul-europe.com/en/solutions/marks/dmark.php
Finland	FIMKO		http://www.ee.sgs.com/product-safety-europe-information-request?wt.mc_id=gCTSglo060&WT.seg_1=fimko&WT.srch=1
France	LCIE		http://www.lcie.com
Germany	VDE		http://www.vde.com/vde/
Germany	TUV Rheineland		http://www.us.tuv.com/product_testing
Hungary	MEEI		http://www.meei.hu
India	Bureau of Indian Standards		http://www.bis.org.in/
Ireland	NSAI		http://www.nsai.ie
Israel	SII		http://www.sii.org.il/20-EN/SII_EN.aspx
Italy	IMQ		http://www.imq.it/en/
Japan	METI		http://www.meti.go.jp/

Country	Testing Agency	Agency Logo	Agency Website
Korea	Korea Testing Laboratory		http://www.ktl.re.kr/eng/index.asp
Kuwait	KUCAS		https://www.pai.gov.kw/portal/page/portal/pai/KUCAS/
Mexico	NOM		http://www.ance.org.mx/operacionesint/introduction.html
Mexico	NOM		http://www.nyce.org.mx/nyceasia/index.php?option=com_content&view=article&id=45&Itemid=60
Netherlands	KEMA		http://www.kema.com/nl/
Norway	NEMKO		http://express.nemko.com
Poland	Polish Centre for Testing/Cert		http://www.pcbc.gov.pl
Russia	GOST		http://www.gost.ru/wps/portal/pages.en.Main
Saudi Arabia	SASO		http://www.saso.org.sa/engsite/testindex4english.php
South Africa	S.A. Bureau of Standards		http://www.sabs.co.za/
Sweden	SEMKO		http://uk.intertek-etlsemko.com/services/s-mark/
Switzerland	SEV		http://www.sev.ch/
Taiwan	BMSI		http://www.bsmi.gov.tw/wSite/mp?mp=2
United Kingdom	BSI		http://www.bsi-global.com/en
United Kingdom	ASTA-BEAB		http://www.intertek.com/marks/asta/diamond/
United Kingdom	ASTA-BEAB		http://uk.intertek-etlsemko.com/services/beab-approved-mark/
United States	Underwriters Laboratory		http://www.ul.com
Uruguay	UNIT		http://www.unit.org.uy/

AC Power Sources

by Jana Brown-Watts

AC power sources offer low cost sources of power at various voltages and frequencies found around the world.

These units are most often used for technical work and allow precision control of the AC voltage, current and frequency. Overseas customers expect products to work when they take them out of the box. Designing products with the international customer in mind gives companies a competitive advantage and increases customer relations. Testing products at the customer's input voltage and frequency offers many advantages. First, knowing the product performs at the customer's voltage and frequency before shipment will allow them to unpack and use the product immediately. The second advantage is having complete control over the construction of the product and not relying on a third party modifying it for local use. By manufacturing the product to the customer's specification in-house it will reduce the chance of faulty modifications by the end customer, and further reduce the product liability exposure.

When a product is built to operate internationally, an AC power source can be used to test the product before export. This ensures the product is performing correctly. If the product is running on the incorrect voltage or frequency it will not be running at its full potential. Using an AC power source to test before export at the customer's voltage and frequency allows for simulation of field conditions on final production models. Fluctuations in the frequency and voltage can be simulated, with voltage tolerances of ±10% and frequency tolerances of ±3 Hz. The manufacturer can save on expensive modifications after the end product is in production by testing during design. For example, if the product is made to be used in the UK it will not be able to be used in North America without modification. It is essential to offer products that are flexible enough to be adapted easily to the needs of local markets, without requiring reconstruction by the end user. Using the proper plug configuration for the country in which it is shipped is also important.

Many companies offer an AC power source. Following are some of the most common features available.

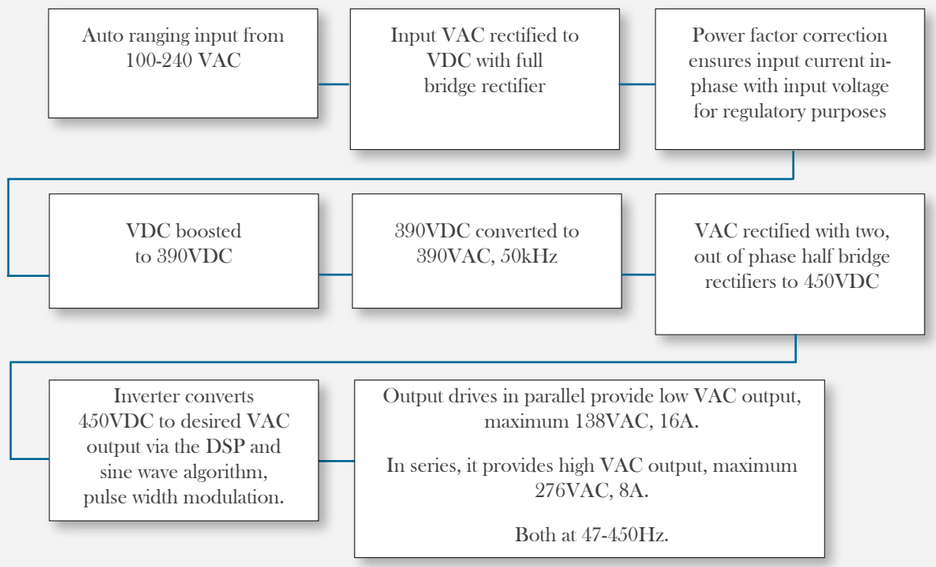
- 7 common international outlets. Low range 10-138Vac and high range 0-276Vac are provided to segregate equipment under test protecting those that are sensitive to higher voltages.
- On/off with over current protection power switch.

- Table mount or rack mount. Rack mount flanges removable. Tilt stand for table mount use.
- Ease of setting output earth ground: Either neutral output tied to earth ground or isolated.
- Auto ranging input for 100 – 240 VAC
- Disconnectable input cord set for ease of configuration for global use.
- Two power ratings offered 1000W and 1500W. 1000W allows North American operation on standard 15amp wall plug.
- Optional USB and RS232 computer interface connections.

AC power sources are also programmable for automated test equipment using SCPI (Standard Commands for Programmable Instrumentation). These are a standard set of commands to control programmable test and measurement devices in instrumentation systems. A series of SCPI commands can be set to manipulate the equipment under test. Some companies selling AC power sources offer interface software which replaces the need to custom program SCPI test routines. A routine is set and the unit will run the routine on the equipment under test. The ability to store and retrieve these routines is also possible with the interface software.

Certified to international product safety standards:
- IEC 61010-1
- ETL
- SEMKO

BELOW IS A FLOWCHART OF INTERPOWER'S INTERNATIONAL POWER SOURCE'S METHOD OF OPERATION



EMC: 101

By Kari DeBruin

Electromagnetic Compatibility or EMC is defined by IEC (International Electrotechnical Commission) as "The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment." These disturbances can be anywhere from interrupting the clarity of your television or something a lot more serious, interference with radar on airplanes.

What is EMI/RFI?

Phenomena that is generated in nature and in electrical equipment as a result of switch closures, and by motors, inductors, and various other complex electrical circuits. EMI/RFI is conducted from the point of origin either through the cables or by radiation through air. In either case, it may present performance problems for adjacent equipment. EMI and RFI are sometimes considered as separate entities, but many companies and organizations tend to combine these terms into one. By definition, EMI and RFI have their own individual frequency ranges, which heavily overlap. The source generates the emission and the coupling path transmits it to the receiving device, which in turn creates the noise or undesirable outcome.

There are three factors of EMI/RFI, which are:

1. The Generation of
2. The Transmission of
3. The Receiving of

Why worry about Electromagnetic Compatibility?

EMC has become an important part of designing electronic equipment because the products being developed are being designed at higher and higher frequencies and will ultimately use higher data rates. Along with higher frequencies, lower voltages that will reduce the carbon footprint will make products more vulnerable to EMI and RFI noise.

Therefore your product has to meet EMC standards before you put your designed product onto the market.

How can I decrease the noise or EMI/RFI In the product I am designing?

Filters play an important part in equipment design, especially in high frequency and medical equipment applications. The typical frequency filtered is 10,000Hz to 30,000,000Hz for noise picked up and conducted through external wires or power cords. 30,000,000Hz to 1GHz is the frequency filtered for noise that is radiating and being picked up through the air. Low-leakage filters are used for medical purposes, as they ensure low levels of leakage current to meet patient safety requirements.

What is insertion Loss?

The effectiveness of the filter measured in the value (in dB) determined from a ratio of the voltage passed through the equipment without filtering, versus the voltage passed through the equipment with filtering. Common mode insertion loss is used to express the amount of signal lost on both the line and neutral conductors (when referenced to ground), due to removal of interference or noise by the filter circuit. Differential mode insertion loss is used to express the amount of signal lost on either the line or neutral conductors (when referenced to the other, i.e. between line and neutral), due to removal of interference or noise by the filter circuit.

Who dictates the requirements for EMC?

EMI/RFI is a problem all over the world when it comes to broadcast signals and sensitive equipment, such as for medical applications. It is usually the country you are exporting to that is put in charge of controlling EMI/RFI. Here are just some of the governing bodies when it comes to EMC.

United States: The Federal Communications Commission (FCC) dictates the guidelines and regulations for most of the products in the United States. However there are some exceptions, most notably some medical products are regulated by the Food and Drug Administration (FDA) and military requirements are mandated by the United States Department of Defense (DoD).

Canada: In Canada the Industry Canada (IC) is the governing body that establishes EMC guidelines. For medical it is the Health Canada (HC) organization.

European Union: For Europe, the European Union has established essential requirements for EMC. What is different about the European Union, they have Governing Authorities in each country to monitor and test devices. The European Union has also established the "New Approach" directives and standards of which EMC is one of them. The signification of compliance with these standards and directives is the CE Mark. For more information please visit the web site at **http://www.newapproach.org**.

Bottom line: Check the EMC standards before you go to market!

Sources:

1) Schramm, David. "EMC Functional Safety." Intertek. N.p., n.d. Web. July. 2012. <http:// www.intertek.com/articles/emc-functional-safety/pdf//>.

2) "Electromagnetic Compatibility." Wikipedia. Wikimedia Foundation, n.d. Web. July-Aug. 2012. <http://en.wikipedia.org/w/index.php?title=Electromagnetic_compatibility&oldid=509274307/>.

3) "European Commission Electrical Engineering." Homepage. N.p., n.d. Web. June-July 2012. <http://ec.europa.eu/enterprise/sectors/electrical/emc/>.

THE HISTORY OF ISO

The International Organization for Standardization (ISO) is the largest standards developing organization in the world.

Dating back to 1947 the ISO has published more than 19,000 International standards. These standards span the breadth of agriculture, construction, mechanical engineering, medical devices and technology. The International Organization for Standardization goes by the acronym ISO to avoid any confusion in translation and comes from the Greek word, isos, meaning equal.

As a non-governmental voluntary organization, the ISO is made up of members who are recognized as standards authorities, with each of its 164 government/country members having one Secretariat representative in Geneva, Switzerland. ISO is comprised of 2700 technical committees and working groups, which are headed by a Secretary. These members must reach a consensus on all solutions, meeting both business and societal needs.

The ISO is governed and guided by a 5-year Strategic plan that is approved by its members; which are divided into three main groupings: full members, correspondent members and subscriber members. These members are the only members who can vote. The ISO also consists of a general assembly, counsel, technical management board, and central secretariat.

The ISO was born from the union of two organizations – the International Federation of the National Standardizing Associations (ISA, founded in 1926) and the United Nations Standards Coordinating Committee (UNSCC), founded in 1944. The merge occurred in February of 1947 after much discussion from global delegates desiring an international unification of standards. For more information on this unification, you can read the following works:


Intertek

Certificate of Registration

The following organization's quality management system has been assessed and registered by Intertek Testing Services NA, Inc. as conforming to the requirements of:

ISO 9001:2008

Organization:

The Interporer Group of Companies

Main Site: 100 Interpower Avenue, Oskaloosa, Iowa, 52577, USA
Additional Sites: 221 South Spruce Street, Lamoni, Iowa, 50140, USA
2900 South East 5th Street, Ames, Iowa, 50010, USA
10 Kelvin Drive, Knowhill, Milton Keynes, Buckinghamshire, MK5 8NH, UK

Certificate Number 95-3821
Initial Certification Date May 18, 1995
Certificate Issue Date September 21, 2010
Certificate Expiry Date September 21, 2013

The Quality Management System is applicable to:

The design, manufacture and distribution of customized cordsets, connectors, terminals, adapters, cable, and electrical test equipment at their locations in Oskaloosa, Ames, and Lamoni, IA (USA) and Milton Keynes (UK).

In the issuance of this certificate, Intertek assumes no liability to any party other than to the Client, and then only in accordance with the agreed upon Certification Agreement.

Intertek Testing Services NA, Inc. – Boxborough, MA, USA

- **The Founding of ISO**, by Swiss delegate Willy Kuert
- **The Formation of ISO**, by scholars JoAnne Yates and Craig Murphy

Three years after its formation, ISO technical committees were producing standards, otherwise known as "recommendations." Its primary focus was to nationalize standards that had already been developed. More information on this development can be found in the work of the Assistant Secretary's writing of The early years. It may be surprising that global perspective on standards development dates back to as far 1949.

However, with international trade growing, international standards were not only seriously needed, they were being demanded by countries involved in trade. Therefore, national standards were soon expanded to international standards. The expansion is well documented and explained in ISO's Secretary General Emeritus, Olle Sturen's, The expansion of ISO.

Decade after decade the ISO continued to expand its reach and development of standards. Below are some of the highlights.

- **General Agreement on Tariffs and Trade** (GATT) Standards Code (1948-1994) – These Agreement on Technical Barriers to trade multi-country codes during this time eventually led to the World Trade Organization (WTO).
- **GATT** became the WTO Technical Barriers to Trade (TBT) (1979)
- **Management Standards** became a focus (1960-80s) Management standards – understand the basics
- **Environmental Management** and standards (1990s) generic management systems standards. This includes ISO 9001 and ISO 14001 on organizational practices, stimulating the development of more ISO standards for the general management systems to now include automotive, customer satisfaction, energy, food safety, local government, education, risk, ship recycling and social responsibility.

The primary focus of ISO standards are to:

- Develop safe, clean and efficient manufacturing and supply of products and services
- Facilitate fair trade between countries
- Provide a technical base and assessment for governments
- Share knowledge and ideas
- Protects users of products and services
- Offer simple solutions to common problems

In order for ISO to develop a standard, a need must be expressed to the ISO. Then the next six steps occur:

Step 1: Proposal stage
Step 2: Preparatory stage
Step 3: Committee stage
Step 4: Enquiry stage
Step 5: Approval stage
Step 6: Publication stage

International Standards are subject for review three years after they are published and then reviewed every five years after that. When more timely publication is necessary, other forms of agreements can be made. These agreements are known as ISO deliverables.

EMI TESTING CHAMBER

By Dan Beeler

An anechoic, or echo free, chamber (*Figures 1 & 2)* is an RF (radio frequency) shielded room which is lined with RF radiation absorbent material (RAM). This type of chamber is used in EMC (electromagnetic compatibility) testing to negate the effect of outside sources of electromagnetic interference during radiated and conducted emissions testing. The RAM tiles, which line the inside of the chamber, as seen in *Figure 3*, also serve to negate reflected RF radiation which could have adverse effects on test results. These flat plates, made of ferrite material, are fixed to all of the interior surfaces of the chamber.

Electromagnetic Interference (EMI) testing is performed to make sure that a piece of electronic equipment will perform properly when it is introduced into to the electromagnetic environment in which it will operate. Each piece of electronic equipment has to be compatible with other equipment and the environment to ensure proper performance that is mandated by testing requirements. To meet these requirements, both radiated and conducted emissions must be measured while the electronic equipment is operated inside the chamber. These radiated and conducted emissions are then measured and recorded to determine if the equipment being tested meet industry standards.

The anechoic chamber helps eliminate, or keep to a minimum, the effects of outside interference such as lightning, man-made RF transmissions from radio and TV stations, and electrostatic discharge. The chamber also limits the effects of electronic noise emissions, self-generated RF transmissions, and cross coupling of electrical currents which are internally generated by the equipment being tested. Proper testing of new electronics equipment could not be accomplished without the aid of anechoic testing chambers.

**Anechoic chamber photos courtesy of Handera, Inc. Des Moines, Iowa. http://www.handera.com/default.aspx*

Figure 1

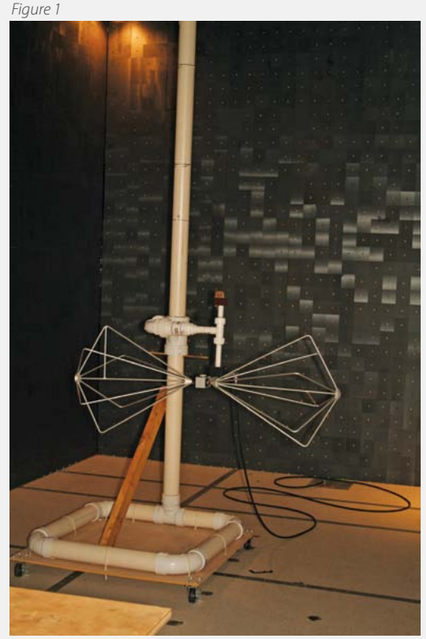
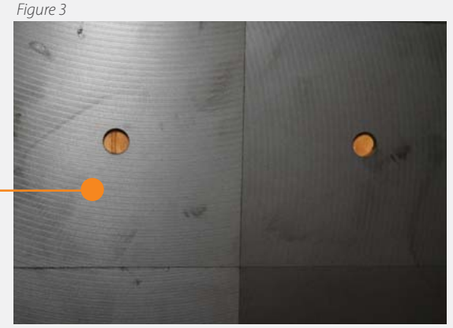


Figure 2

Figure 3



Upcoming Trade Shows

Each year Interpower Corporation attends shows throughout the United States and Europe. Not only does it give us the opportunity to display and highlight our products, but it also gives us a chance to visit with you. Stop by and see us at one of the following shows.

October 31-Nov 1 — **MD&M Minneapolis**
at the Minneapolis Convention Center in Minneapolis, MN, Booth#616

November 5-7 — **IEEE Symposium on Product Complicence Engineering**
at the Double Tree by Hilton Portland, in Portland, OR

Oldest Sales Representative Firm on the West Coast

Serving your electronic needs since 1947

By Judy Nunnikhoven

Ross Marketing Associates
Electronic Engineering Representatives

Interpower Corporation partners with Independent Sales Representatives across the United States and Canada to assist you with your design applications, placing orders, expediting orders, etc. Our Sales Representatives are knowledgeable and work hand in hand with Interpower, to meet you, our customer's needs. A complete list of your Sales Representatives can be found on pages

Our local Sales Representative in Northern California, Northern Nevada and Hawaii is Ross Marketing Associates. Ross Marketing Associates was founded by David H Ross in San Francisco in 1947. In the early 50's they moved the office south, to Silicon Valley to follow their customers. Steve Ross took over from his father, David, in the mid 70's and guided the company and its growth until he retired in 2001. Ross Marketing Associates joined Interpower Corporation's team in 1983. Kevin Frost, the current owner of Ross Marketing, joined the company in 1984 as an outside sales representative.

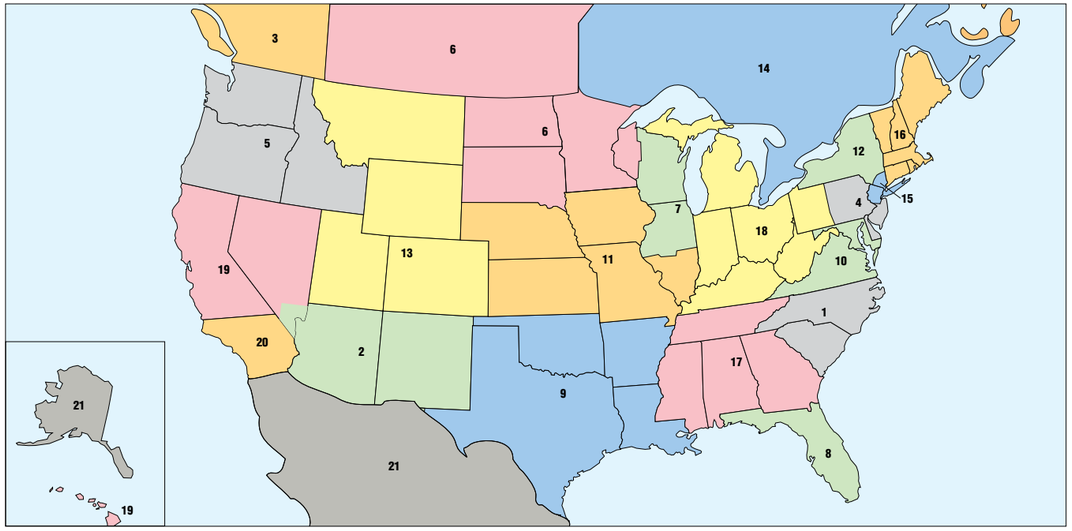
Ross Marketing Associates' vision is to be a leading edge manufacturers' representative by providing engineered component and subsystem solutions to electronic OEMs, CEMs and distributors in Northern California, Northern Nevada and Hawaii. Their major markets include military, aerospace, audio, broadcasting, networking, communication, computer, electronic gaming, instrumentation, medical, and semiconductor equipment. Their line card includes, cord sets, power components, enclosures, switches, industrial connectivity, LED's, DC/DC convertors, power supplies, thermal management and vibration isolation products

The sales team at Ross Marketing Associates is willing to work with you on any of your projects. Some of their more "interesting" requests include a power cord for equipment that artificially inseminates large animals and a power cord for a robotic hair transplant machine.

Ross Marketing Associates and Interpower Corporation have teamed up numerous times to help a customer in a tight spot. Most recently a customer had a glitch in their MRP system that overlooked their need for accessory power strips. The customer placed an order for a 100 pieces with an immediate requirement of 25. Interpower Corporation only had 5 units in stock. The customer had equipment that needed to be installed in different hospitals and had special installers waiting to install the equipment. Interpower was able to assemble and ship the extra parts in three days. This allowed the customer to ship their product on time and saved the cost of paying for idle installers, had the equipment not shipped in time.

Ross Marketing is located in Mountain View, CA. Their team of 6 employees are ready to help you with your design and product needs. They can be reached at **650.691.0119** or by e-mail at **info@rossmarketing.com**

Looking for an Interpower Corporation Sales Representative?



1. **Avalon Enterprises**
   Raleigh, NC 27619
   Phone 919.821.5777
   Fax 919.821.7080
   Audrey.valone@avalonenterprisesinc.net

2. **Carlberg & Associates**
   Tempe, AZ 85281
   Phone 480.377.0760
   Fax 480.970.0767
   tammyl@carlbergs.com
   www.carlbergs.com

   Carlberg & Associates
   El Paso, TX 79912
   Phone 915.309.0009
   E-Fax 505.212.0029
   raulh@carlbergs.com
   www.carlbergs.com

3. **Darmac Agencies, Ltd**
   #28-7501 Cumberland St.
   Burnaby, BC
   Phone 604.520.7121
   Fax 604.524.2162
   www.darmac.ca

4. **Eastern Scientific Mktg. Inc**
   Norristown, PA 19403
   Phone 610.539.2181
   erniefrank@comcast.net
   www.easternscientificmarketing.net

5. **Electro-design**
   McMinnville, OR 97128
   Phone 503.472.0481
   Fax 503.472.8254
   info@electro-design.com
   www.electro-design.com

   Electro-design
   Bellevue, WA 98005
   Phone 425.641.4170
   Fax 360.825.4058
   info@electro-design.com
   www.electro-design.com

6. **ElectroTek Int'l Corp**
   Apple Valley, MN 55124
   Phone 952.891.4191
   Fax 952.891.4970
   jenecain@pclink.com

7. **Gtronics, Inc**
   Lincolnshire, IL 60069
   Phone 847.478.9155
   Fax 847.388.4749
   katiehodal@aol.com

8. **HHP Associates, Inc**
   Lake Mary, FL 32746
   Phone 407.829.8792
   Fax 407.829.8798
   bfarber@hhpai.com
   www.hhpai.com

   HHP Associates, Inc
   Tampa, FL 34655
   Phone 727.638.6313
   Fax 407.829.8798
   dwalters@hhpai.com
   www.hhpai.com

   HHP Associates, Inc
   Palm Coast, FL 32746
   Phone 321.303.2732
   Fax 407.829.8798
   rboos@hhpai.com
   www.hhpai.com

   HHP Associates, Inc
   Deerfield Beach, FL 33441
   Phone 954.304.4648
   Fax 407.829.8798
   bderamo@hhpai.com
   www.hhpai.com

9. **Hughes Cain & Associates**
   Lewisville, TX 75067
   Phone 972.221.1536
   Fax 972.221.1537
   jimmy@hughescain.com
   www.hughescain.com

   Hughes Cain & Associates
   Georgetown, TX 78628
   Phone 512.528.0607
   Fax 972.221.1537
   chris@hughescain.com
   www.hughescain.com

   Hughes Cain & Associates
   Brownsville TX 78526
   Phone 011.52(186) 8158-1123
   Fax 972.221.1537
   ernesto@hughescain.com
   www.hughescain.com

10. **Jacobsen Associates Inc**
    Horsham, PA 19044
    Phone 215.674.2937
    Fax 215.441.8706
    sales@jacobsenassociates.com
    www.jacobsenassociates.com

11. **M-S-B Associates, Inc**
    Eureka, MO 63025
    Phone 636.938.3227
    Fax 636.938.9224
    msbsttlou@aol.com
    www.msb-associates.com

12. **Net Sales Company**
    Victor, NY 14564
    Phone 585.924.1844
    Fax 585.924.1789
    kpaladino@netsalesrep.com
    www.netsalesco.com

    Net Sales Company
    Clifton Park, NY 12065
    Phone 518.371.6864
    Fax 518.371.2824
    gstewart@netsalesrep.com
    www.netsalesco.com

13. **Omega, Ltd**
    Littleton, CO 80120
    Phone 303.762.1921
    Fax 303.762.1928
    info@omegaltd.com
    www.omegaltd.com

14. **Optimum Components Inc**
    Markham, ON L3R 0B4
    Phone 905.477.9393
    Fax 905.477.6197
    sales@optimumcomponents.com
    www.optimumcomponents.com

    Optimum Components Inc
    Kirkland, Quebec, H9H 3C4
    Phone 450.510.0303
    Fax 450.510.0302
    sales@optimumcomponents.com
    www.optimumcomponents.com

15. **Pacent Engineering Corp**
    White Plains, NY 10605
    Phone 914.390.9150
    Fax 914.390.9152
    paul@pacentengineering.com
    www.pacentengineering.com

    Pacent Engineering Corp
    Lincoln Park, NJ 07035
    Phone 973.709.9616
    Fax 914.390.9152
    tony@pacentengineering.com
    www.pacentengineering.com

    Pacent Engineering Corp
    Ocean, NJ 07712
    Phone 732.922.2755
    Fax 732.922.2772
    wgp@pacentengineering.com
    www.pacentengineering.com

16. **Ray Perron & Company**
    Needham, MA 02492
    Phone 781.449.6162
    Fax 781.444.1074
    tkelley@rpc-inc.com
    www.rpc-inc.com

17. **Rep, Inc**
    Huntsville, AL 35803
    Phone 256.881.9270
    Fax 256.882.6692
    sale@repinc.com
    www.repinc.com

    Rep Inc
    Anderson, SC 29621
    Phone 704.905.7846
    Fax 256.882.6692
    sales@repinc.com
    www.repinc.com

    Rep Inc
    Norcross, GA 30071
    Phone 770.662.8982
    Fax 256.882.6692
    sales@repinc.com
    www.repinc.com

18. **Rockford Controls**
    Westlake, OH 44145
    Phone 800.572.0479
    Fax 440.899.2820
    sales@rockfordcontrols.net

    Rockford Controls
    Eaton, OH 45320
    Phone 937.456.5005
    Fax 440.899.2820
    sales@rockfordcontrols.net

19. **Ross Marketing Associates**
    Mountain View, CA 94043
    Phone 650.691.0119
    Fax 650.691.0130
    info@rossmarketing.com
    www.rossmarketing.com

20. **Schoenbachler EMS**
    Tustin, CA 92780
    Phone 714.544.1888
    Fax 714.544.1887
    sales@schoenbachlerems.com
    www.schoenbachlerems.com

    Schoenbachler EMS
    Torrance, CA 90503
    Phone 310.371.4282
    Fax 310.371.2623
    semsla@msn.com
    www.schoenbachlerems.com

21. **Interpower Corporation**
    Oskaloosa, IA 52577
    Phone 800.662.2290 (US/CAN/PR/VI)
    641.673.5000
    info@interpower.com
    www.interpower.com

INTERPOWER *Pointz:*

A Polarizing Experience

By Ralph Bright

A common definition of polarization is the displacement of positive and negative electric charge to opposite ends of a nuclear, atomic, molecular, or chemical system, especially by subjection to an electric field. Electric charge is defined as the quantity of unbalanced electricity in a body (either positive or negative) and construed as an excess or deficiency of electrons.

Some wiring systems have two circuit conductors, both of which have a significant potential with respect to earth ground. Where the wiring system defines a "neutral" conductor that is connected to earth ground, it is an advantage for appliance designers to maintain that distinction. This requires a plug that can only be connected in one way to the wall socket, so that the energized and neutral conductors are not interchanged. Such "polarized" plugs cannot be interchangeable with non-polarized receptacles.

Polarization is maintained by the shape, size, or position of plug pins and socket holes to ensure that a plug fits only one way into a socket. The (single pole) switch of the appliance is then connected in series with the energized wire. For an appliance such as a toaster, putting the exposed heating wires on the neutral side of the switch provides a small measure of extra protection against electrical shock; similarly, lamps with Edison screw bases will connect the screw shell of the lamp socket to the neutral conductor.

Polarization of European plugs and sockets:

Some European plug and socket patterns pose a problem in regards to polarization. Plug and socket patterns such as the Italian and the Continental European are physically unpolarized, meaning they can be plugged into a socket in more than one manner. The Continental European standard is especially difficult, as it is not electrically polarized either, meaning the standards governing this pattern do not indicate a specific location for the hook-up of line and neutral.

The French/Belgian pattern allows for physical polarization of the plug, but once again the standard does not indicate a specific electrical polarization. In other words, the socket may be wired either way. When designing for export, it is very important to take into account how unpolarized plug and socket patterns will affect your equipment.

If you have questions regarding polarization, or you have another topic you would like to see covered in Interpower Source, please e-mail us at **infopower@interpower.com**.

There are two types of polarization to consider when dealing with international plugs and sockets:

1) **Physical Polarization**— Characteristics of a plug that only allow the plug to be plugged in a certain way.

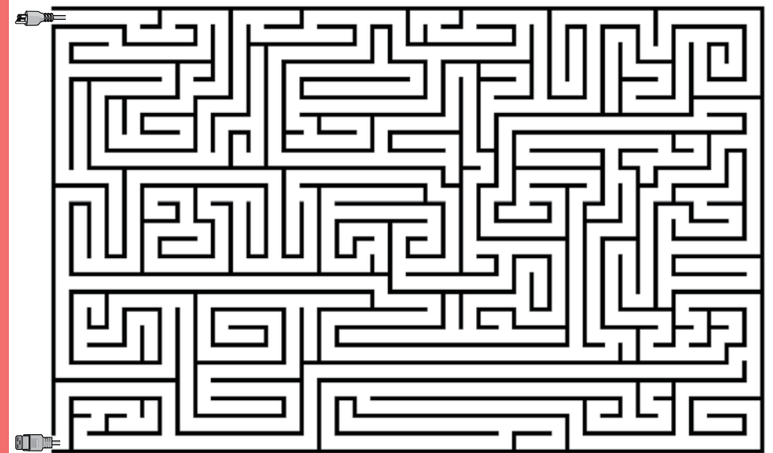
2) **Electrical Polarization—** referring to the line and neutral being specified as always being connected to a specific pin location.

POWERSOURCE *Play*

fun FACTS

1. What is Electromagnetic Compatibility (EMC)
2. Who sets the EMC requirements in the United States?
3. Who sets the EMC requirements for the European Union?
4. What is Class A as defined by the FCC?
5. What is Class B as defined by the FCC?

MAZE



For answers to the fun facts and maze this month, please go to www.interpower.com /ic/answers

1. It is defined as the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable disturbances to anything in that environment. EMC requirements concern two basic concepts: emissions and immunity or susceptibility. (compliance Engineering) 2. The Federal Communications Commission. (FCC) 3. The European EMC Directive, 89/336/EEC, sets out the legal requirements on EMC. 4. A device which is marketed for use in an industrial application and is not intended for use in the home or residential area. 5. A device that is marketed for use in the home or a residential area by the customer.

Interpower Corporation
2900 SE 5th St
Ames, IA 50010-9938

Find us on Facebook
http://www.facebook.com/interpowercorporation

Read the InfoPower Blog
http://www.interpower.com/ic/infopower-2/