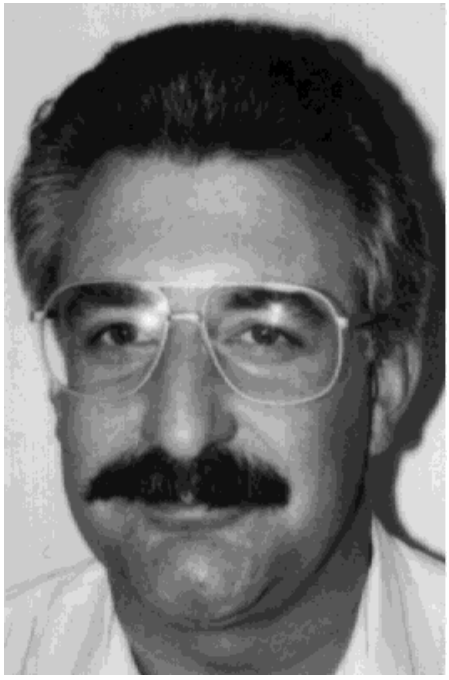
The Product Safety Newsletter

IEEE ®

What's inside

Volume 4, Number 1 January/February 1991

Chairman's Message



As I mentioned in the last issue of the *Newsletter*, it's time to say farewell as your Chairman. I really have hung up the phone. (Yes, I realize that the picture has not improved, but the phone IS gone!)

As you will read elsewhere in the Newsletter, it is time to elect new officers. To get back on my soap box one last time... "It's **your** organization. Take the time to participate and make your voice heard. VOTE! Your vote will make a difference." ...off the soap box. I'll be sure to pass it along to the next Chairman.

My tenure as Chairman has been rewarding. I have truly enjoyed witnessing a vision become a reality. I have also had the opportunity to meet many new people, creating greater professional contacts and new friends.

Many people have contributed to the success of this group. A need was recognized. The need was addressed. I take this opportunity to thank each and every one of you who contributed.

Special thanks go to John McBain, Roger Volgstadt, Ken Warwick, the officers of the local groups, past and present, and the sponsors of the Institutional Listings. You have clearly been the backbone of the organization and of our primary deliverable, this Newsletter. Without you, they could not, indeed would not, have come into being.

I would also like to extend a special thank you to the IEEE EMC Society Directors and Members for their support in helping us become a part of the IEEE. Your continued support is paramount in helping us promote enhanced professionalism and technical expertise within the profession of electrical product safety engineering.

We have come a long way over the past few years; from a few engineers with an idea to a recognized professional group. But only the surface has been touched. We have a long way to go to achieve all of our goals. I have no doubt that persistence will prevail and we will achieve greater success.

I look forward to continuing as a member of this fine group and hope to be able to serve your needs in the future.

With best regards,

Rich Pescatore
Chairman

The Product Safety Newsletter

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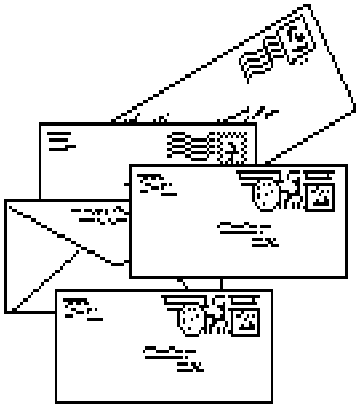
Letters to the editor



Canadian Telecom:
This is with regard to an article published in the September/ October, 1990 issue of the Product Safety Newsletter entitled "CSA Required for DOC Submissions".

Our Terminal Attachment Programme specification requirements for Canadian Standard Association (CSA) certification are summarized as follows:

1) Terminal equipment which derives power from batteries or the telecommunications network is exempt from CSA certification.

2) AC powered equipment must meet the requirements of either OPTION A (CSA certification) or OPTION B (dielectric strength test and engineering analysis). These options are described in Certification Standard CS-03, Issue 7, Part I, Section 1.4.

In previous years, it was our practice to accept an application for certification of equipment which was simultaneously under application with CSA. This practice, which essentially was a third option, required us to handle the same submission more than once and caused unacceptable processing delays which were beyond our control. These delays caused a formidable backlog of pending applications. Our industrial clients found this situation unacceptable, therefore, we amended our procedure so that CSA certification (when applicable) must be obtained prior to filing an application for DOC approval.

Your article states that we no longer accept the above mentioned OPTION B. Our requirements remain unchanged in this regard; OPTION B is acceptable as an alternative to OPTION A.

We have attached a copy of Section 1.4 of the current issue of CS-03. In order to avoid the possibility of inadvertently confusing your readers about DOC telecommunications specification requirements, we would be pleased to review draft copies of such articles.

Yours truly,

Jim Lafreniere, Manager
Radio & Terminal Equipment
Certification Section

Excerpt from CS-03:

1.4 DIELECTRIC STRENGTH REQUIREMENTS AND TESTS

TE shall meet the requirements of one of the options specified below to assure protection of the network against hazardous voltages that could arise from:

(l) Non-certified equipment connected behind TE.
and
(2) AC powered equipment.

1.4.1 OPTION A

The TE shall be CSA certified to the appropriate CSA standard C22.2.

1.4.2 OPTION B

The TE shall meet the dielectric strength tests of Section 1.4.2.1. The applicants shall ensure that 100% of the TE units offered for sale will be subjected to the dielectric strength tests of Section 1.4.2.1 and that the procedural requirements of CP-0l are met.

1.4.2.1 DIELECTRIC STRENGTH TESTING

TE, when disconnected from all normal external circuits and grounding conductors shall withstand for 60 s without breakdown, a test voltage applied between all telecommunication network connections connected together and;

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News and Notes

[Our readers are our greatest source of information. We thank you and remind you if you see a news item or an article that may be of interest to the product safety community, please send it to the Product Safety Newsletter, attention: Editor. We will gladly recognize the contribution as yours.
-Ed]

Research Continues into E-Field Dangers

The January 19, 1991 edition of the San Jose Mercury News newspaper reports that a mock neighborhood has been set up in Massachusetts to explore the cancer link to electrical fields. The Electric Power Research Institute, a non-profit institution financed by the utilities has built the neighborhood as part of their study. Instead of homes, squat gray panels fed by power lines have been constructed. Director Gary Johnson of the Electric Power Research Institute's magnetic field research facility notes "If we have a problem here, we need to know about it and decide what can be done about it and what options do we have available". Four-foot high panels with instruments represent houses with typical wiring. A 1200 foot long power distribution line runs overhead as well as high-voltage lines; another electrical system runs beneath the ground. The study is designed to measure and identify the sources of magnetic fields surrounding the average person. The tools and measurement procedures developed will then be used in the institute's environmental studies that will try to answer the question of whether there is a health link.

A disputed EPA report published last summer states that there is considerable evidence from more than a dozen scientific studies that shows that high exposure to electromagnetic fields from power lines are a "possible, but not proven cause of cancer in humans". Some members of the utility industry have criticized the report. "There is fairly significant proof that the fields are in some way associated with biological effects. Exactly what exposure causes how much disease we have no idea", said Martin Halper, director of the analysis and support division of the EPA in Washington. "We really don't know whether what we're talking about has a significant public health impact."

Quality Standards ISO 9000 Series

The European Community, the United States and 14 other countries have adopted the ISO 9000 series of Quality Assurance Standards as their national standards for all quality assurance requirements. In Canada, the Z299 series, issued by CSA, are comparable. But if your market includes the European Community, Lamothe/Ultratech thinks that manufacturers should base their quality program on the 9000 series.

[The ISO 9000 information is reprinted with permission from the M.A. Lamothe & Associates Inc./ UltraTech Engineering Labs, Inc. January/February, 1991 Newsletter.]

Northeastern Chapter Strikes Out on Its Own

The former Northeastern Chapter of the Product Safety Society, after a long and sometimes acrimonious debate among members, dating back to July 1988, decided to incorporate in the state of Massachusetts as an independent non-profit association.

Voting was limited to people on the mailing list of the local newsletter, *Product Safety Society Northeastern Chapter Newsletter*, edited and distributed by Bill von Achen of Dash, Straus and Goodhue (DS&G). Votes came from Connecticut, Maine, Michigan, New Hampshire, New Jersey, New York, Ohio and Texas, as well as Massachusetts.

The choice was being made between organizing as a private society or becoming a technical committee of the local IEEE/EMC Chapter. A third alternative which had been considered at one time, continuing to meet as an informal group with meeting locations, speakers and refreshments arranged

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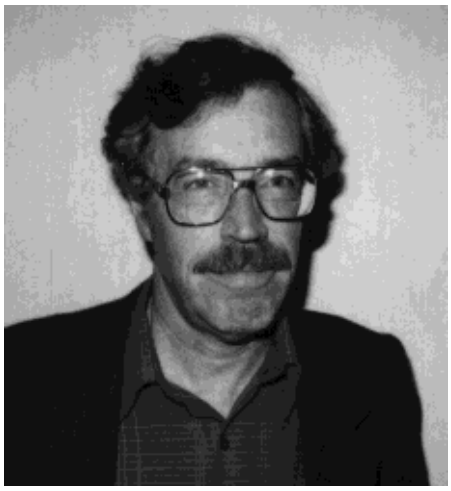
Technically Speaking



CAPACITIVE DISCHARGE SHOCK FROM CRT FACEPLATES

Copyright 1991 by Richard Nute

While cleaning the CRT faceplate of the computer color monitor display, a person received a painful electric shock at the other hand which was touching the top of the monitor plastic enclosure. This person lost several days of work recuperating from the shock.

While listening through headphones to an audio disc in a CD-ROM drive, a person started cleaning the CRT faceplate of the computer color monitor display. That person received a painful electric shock in both ears!

While carrying a monitor across a room, a person got a shock through the openings in the enclosure. (The monitor was disconnected from everything!)

While talking on the phone, a person absentmindedly began cleaning the color monitor screen, and received a startling shock into the ear.

These are true incidents. While they all involve color CRT, there are no geographic, weather, product model, manufacturer, or other coincidences.

Many people have received shocks from CRT faceplates. Almost everyone attributes the shock to static electricity.

Static Electricity:
Static electricity is defined as stationary electric charges, such as those resulting from friction.

If the shocks are due to static electricity, what is the mechanism which generates the static electricity in the first place?

Three of the incidents involved cleaning the CRT faceplate while the monitor was on. This involves rubbing a cloth across the screen, which could be the source of the friction.

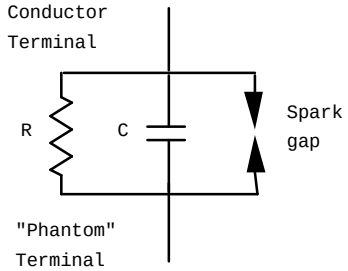
However, if we perform the same cleaning operation on a window, there is no static electricity. If we perform the same cleaning operation with the monitor off, there is no static electricity.

If the phenomenon is friction-generated static electricity, then why is a charge generated only on a CRT which is on, and not from a CRT which is off or not from an ordinary window?

How does the friction-generated static electricity hypothesis explain the shock incident where the monitor was off, and was being carried across the room? How does the static electricity hypothesis explain the phenomenon as only occurring on color CRT and not on monochrome CRT?

Clearly, traditional static electricity concepts do not explain the observed phenomena.

Insulation Model:
Insulation can be modeled as a parallel circuit of a capacitor, a resistor, and a spark-gap.



The principal characteristic of an insulator is that, normally, the values of resistance, capacitance, and spark-gap breakdown voltage are sufficiently high (low for the capacitance element) that they can be ignored as circuit elements.

Another characteristic of an insulator is that, often, it has a conductor

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The EC Global Approach to Certification and Testing COM(89)209

by J. P. Tuthill
National Standards Authority of Ireland

Much has been said about COM(89) 209 since its publication in August of last year by the Commission of European Communities. Many questions have been raised and confusion abounds both in and outside of Europe. This much is clear: the 88 pages of complex proposal is the game plan of conformity assessment for commodities entering the EC Single Market. It has gone beyond the status of a mere proposal from the Commission to the adopted process of compliance to the Technical Harmonization Directives, via the EC Council of Ministers Resolution of December 21, 1989 (90/C 10/01).

The definite reality of COM(89) 209 has suppliers, manufacturers, testing and certification bodies begging for a precise explanation of operating the Global Approach. In the U.S. inquiries are rampant from both public and private sector groups, asking the EC Commission for exact details of procedure in this conformity assessment doctrine. One of the best sources of EC Global Approach information, is from the *ANSI Global Standardization News*, data collected from ANSI's Brussels, Belgium office. ANSI has published three of these reports; by far the most informative regarding COM(89) 209 is ANSI Global Standardization Report #3.

There are at least 3 major elements of the Global Approach philosophy and 3 primary disciplines, which are significant to its operation. The 3 elements are:

(a) Conformity Assessment Modules
(b) Notified Bodies
(c) the "CE" Mark

and the 3 primary disciplines (not discussed here) are:

(i) Testing Laboratory Accreditation thru EN 45000
(ii) Assessment of Certification Bodies by EN 45000
(iii) Quality Management Registration thru EN 29000

The Conformity Assessment Modules are 8 modules of assessment disciplines (Modules A - H), whereby the supplier or manufacturer can demonstrate their compliance to EC Technical Directives through assessment/testing of the company or product for the EC marketplace. Upon successful execution of the selected module(s), the "CE" mark is placed on the commodity and the supplier's Declaration of Conformity is provided to the seller. The 8 modules describe the application of product testing/verification, laboratory accreditation and quality management systems. Each of these modules specifies one method of compliance to EC Directives and all but Module A involves the intervention of a Notified Body. Even Module A includes action by a Notified Body in a variation program known as Module Aa.

Obviously, any Corporation familiar with the modular approach, hopes to be able to use Module A in their EC marketing endeavors, as it is the only one which allows exercising the Declaration of Conformity and "CE" mark usage without involvement of a Notified Body. It is my feeling that very few companies in the High Tech area will be allowed to use Module A, as the majority will find their products fall into both regulated and non-regulated areas, according to the EC Directives. The Commission will determine which Modules can be used in accordance with its Technical Directives and in so doing, the choices of selection will be categorically controlled.

The Notified Bodies are simply organizations of product testing, product certification, assessment groups for testing laboratories and quality systems which are notified by the governments of the EC Member States. Through this notification process the multilateral Mutual Recognition Agreements in the EC will be initiated; the management of M.R.A. will be the principal work

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Area Activity Reports

Central Texas:
The next meeting of the Central Texas (previously called "Austin") Chapter of the PSTC will be in conjunction with the Central Texas EMC Society Chapter at Peppers at the Falls in San Marcos on March 21, 1991. Social Hour will start at 6:30 p.m., no-host dinner at 7:00 p.m. and the presentation at 8:00 p.m.. Everyone (including spouses) is welcome to join us.

Meetings are presently planned to continue to be held in conjunction with the EMC Society Chapter on the third Thursday of each month, alternating between San Marcos and New Braumfels. Please contact Vic Balswin at ROLM Systems (tel. 512-469-7289) or David Staggs at Dell Computer Corp. (tel. 512-343-3751) for additional details.

Chicago :
Dick Hagedorn reports that while he has a large mailing list of professionals interested in Product Safety issues, he has had difficulty in arranging for speakers. Perhaps a vendor, a teacher, or a product safety professional has prepared a presentation that they would like to present. Should anyone in the Chicago chapter area know of speakers knowledgeable in topics relevant to the Product Safety profession, they are encouraged to contact Mr. Hagedorn at (708) 505-5722.

Northeast:
See the article in "News and Notes" elsewhere in this issue.

Orange County/Southern California/
The January meeting featured a presentation by Mr. Ed Spooner of TÜV Rheinland on the common pitfalls of EN 60950. His very informative and interesting presentation led to an extensive discussion of issues that were raised. We highly recommend that you don't miss future meetings, because chances to participate in such discussions with your professional peers are extremely valuable!

Several articles were available at the meeting. If you could not attend the meeting and desire a copy of one of the following items, please contact Charlie Bayhi or Ercell Bryant. Better yet, come to the next meeting!!!

Meeting distribution items:
* "18 Frequently Specified Deviations to EN 60950"
* "EPA Report Radiates Heat" (Electronic Times, 1/7/91)
* "Power Factor Correction for Power Supplies" (Electronic Products, March 1989)
* "San Francisco Ordinance 405-90, Regulation of VDTs"
* "Effects of Radiation on Biological Systems" (Seminar, George Washington University, 3/11-13/91)
* "ELF/VLF Emissions" (EDN, 11/15/90)
* "Mystery - and Maybe Danger - in the Air" (Time, 12/24/90)

IMPORTANT ANNOUNCEMENT: THE MEETING LOCATION HAS BEEN MOVED!
The next meeting on February 5, 1991, will be held at FileNet Corp., 1550 Scenic Avenue, Costa Mesa, starting at 6:00 p.m. Dave MacKenzie will be speaking about "Software Structure Testing for Safety". It's not just hardware anymore! Please call Ercell Bryant at 714-966-3459 for details.

Portland and Seattle:
The most recent meeting of the Portland Chapter featured Mr. John Brecunier from Telemekinic who discussed various hazards in the industrial environment.

San Diego:
The January 9 Product Safety meeting started at 6:00 p.m. with 18 people in attendance. Some business items were taken care of before the technical presentation. Officers who volunteered at the last meeting were confirmed. Meeting schedules and reports are planned to be published in both the *Product Safety Newsletter* and the *San Diego IEEE Newsletter*. Suggested topics for future meetings included European product liability and methods for ensuring traceability of incoming materials to agency requirements.

Ray Jimenez distributed interesting information, including CSA and

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"Is the TA of the TC on the WG of the SC?" and Other IEC Questions

by Rich Nute

To give you a rough road-map to IEC organizations ...

The top-level committee in a particular field is designated a TC-XX, where TC = Technical Committee and XX is the number, assigned sequentially.

A TC may establish one or more SC's, where SC = Sub-Committee. The SC's are designated by the letters "SC" followed by the committee number followed by a suffix letter, assigned sequentially; for example, SC-XXA, SC-XXB, SC-XXC, and so forth.

Both TC's and SC's may set up WG's, where WG = Working Group. They are designated by adding a suffix to the committee designation. For example, TCXX/WG1 and SCXX/WG1. (These are two, different working groups.)

TC's and SC's are comprised of delegates, usually one from each country, but more are possible. (The USA has four delegates to TC-74.) WG's are comprised of experts, without regard to country. An individual can be a delegate to both the TC and the SC, and can also be an expert to a WG. Usually, however, there are separate individuals who are delegates to a TC and an SC, and who are experts to WG's.

The output of IEC committee work is a standard. Papers can be generated by a WG, an SC, and a TC. Papers generated by a WG must be submitted to the parent SC or TC for further consideration. "Official" output of a WG is limited to WG members and parent SC or TC members. A WG paper, when agreed to by the parent SC or TC, will be elevated to an SC or TC paper. SC and TC papers may be for member information, or may be distributed to countries for comment. Following national comments to an SC or TC paper, a paper may be submitted to countries as "policy" or for voting. Generally, such papers will be designated Draft International Standards (DIS). (All lower level papers are designated "Secretariat" papers as they are the product of the committee secretary.)

Each country sets up its own process for arming its TC and SC delegates to deal with IEC TC and SC issues. In the USA, the chief IEC TC and SC delegates are "TA's" or "Technical Advisors"; any others are just Delegates. TA's are encouraged to set up a TAG, Technical Advisory Group, by which the TA gathers pertinent information. But, a TA is not required to set up a TAG.

TA's and Delegates are "approved" by the USNC (U.S. National Committee to the IEC), which is a function of ANSI. Generally, the USNC will accept any willing person as a TA. (There are a number of TC's and SC's in which the USA does not participate simply due to a lack of warm bodies!) To become a TA to an SC generally requires the assent of the TA to the parent TC. To become an expert to a WG requires assent (invitation) by the WG secretary. In practice, a letter from the TA to the WG secretary does the job of getting someone on a WG.

If an individual wishes to participate in the development or revision of an IEC standard, then first he must decide whether to participate at the SC level or at the WG level, or both. Once he decides what he wants to do, then contacting the appropriate TA is the next step. Names of present TA's may be obtained from the USNC. Of course, having your company's support or being independently wealthy is helpful, too, since attending meetings can require extensive travel.

Now the answer to the question, "Is the TA of the TC on the WG of the SC?", should be obvious. I'll leave it as an exercise for the reader.❖

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by DS&G, was not listed on the ballot.

This Boston-area-based product safety group was originally started by Jim Norgaard of DS&G in early 1988 as a branch of the Product Safety Society, the precursor of the present Product Safety Technical Committee (PSTC) of the IEEE/EMC Society. Besides being organizer and first chairman of the local group, Jim was also Vice-Chairman of the PSTC when it was first formed. However, the Northeastern Chapter never made formal contact with the local EMC Society Chapter and never had elections to choose local officers for the group. When Jim left DS&G, Bill von Achen took over as meeting convenor and chairman.

Copies of a proposed constitution (dated 1/11/91) have been sent for approval to those people on the local newsletter mailing list. Incorporation would be able to take place immediately following approval of a constitution. The "approval ballots" also request nominations for officers, to be confirmed by attendees at the January 30 meeting. Bylaws detailing fees, committees, duties, elections and other procedures will be written after the election in February.

UL Seminars on UL1950

Underwriters Laboratories is continuing a series of seminars on their Standard for Information Technology Equipment. The next locations and dates are: Orange County, 3/19-20/91; and Boston, 5/22-23/91. For more information call Sandie Collins at UL (Northbrook) at 708-272-8800.

System Safety Society Holds Conference

The Tenth International System Safety Conference will be held in Dallas, Texas, from July 18 - 22, 1991. Events will include three daily concurrent sessions, a mock product liability trial, numerous exhibits and displays, an awards banquet and more. For more information contact the conference chairperson, Mike Sawyer, at 214-492-9005.

Zurich EMC Symposium

The Ninth International Zurich Symposium & Technical Exhibition on Electromagnetic Compatibility will be held from March 12 - 14, 1991, in central Zurich, Switzerland, sponsored by the Swiss Electrotechnical Association (SEV/ASE). Of special interest to product safety engineers will be the session on biological effects of electromagnetic fields. For more information contact the Symposium Chairman, Dr. G. Meyer, at phone (+411) 256 2790 or the Organizing Committee at phone (+411) 256 2788 or fax (+411) 262 0943.

"Product Compliance, First Principles"

A colloquium and exhibition in Santa Clara, California, is being sponsored by the Santa Clara Valley Chapter of the IEEE EMC Society from June 12 - 13, 1991. Program topics include managing the compliance process, fundamentals of EMC design, commercial and military EMC issues, product safety and telecom. A number of exhibitors will be demonstrating their latest developments, as well. As the theme suggests, the colloquium will cover a broad range of product compliance issues and will be especially useful to those who may have regulatory compliance responsibility in more than one area. For more information please call the chairman, Dave Hanttula, at 415-335-1071 or the publicity chair, Darryl Ray, at 408-974-6257.

VDT Stress - Could it be Acoustics?

Two researchers at the University of Evansville, Indiana, report a linkage between noise made by many video display terminals with stress symptoms in women, who hear high-frequency sounds better than men. The 16 KHz tone, common in most VDTs, can affect women even when they don't consciously notice it, while men seldom hear frequencies above 15 KHz. Students asked to do tasks where the high-pitched sound was created at about the level of normal conversation speeded up and doubled their errors - symptoms of high stress. The researchers speculated that further study could link the noise with miscarriages and other health problems. (San Jose Mercury-News, 8/12/90)

VDT Stress - It could be Ergonomics

Pacific Bell has started a two-year $8 million program to reduce injuries associated with using video display terminals at work. Such injuries as "repetitive motion injury" and "carpal tunnel syndrome" were estimated to cost the company $6 million in 1990. The program will include training for computer operators, new ergonomic equipment and improved lighting. (San Jose Mercury-News, 8/16/90)❖

Continued from page 5

at only one terminal of the model; the other terminal of the model is a "phantom" conductor. Nevertheless, the insulator ALWAYS behaves as if a conductor actually exists at the "phantom" terminal AND that the "phantom" terminal is connected to some other circuit element which completes the circuit.

As is the case for insulation resistances, capacitances, and breakdown voltages, usually the circuit elements at the "phantom" terminal can be ignored.

However, in the case of electric shock from the CRT faceplate, if we ignore the "phantom" terminal of the CRT faceplate insulation, and if we ignore the remaining circuit, then we cannot explain how the shock occurs.

Circuit for electric shock from CRT faceplate:
Clearly, for an electric shock to occur, there must be a circuit — a voltage source and a current path.

For an electric shock from the CRT faceplate, the circuit must include a voltage source, the faceplate insulation, AND a circuit path to ground.

Furthermore, we have two, DIFFERENT circuits:

1) The circuit WITHOUT the body as a circuit element.
2) The circuit WITH the body as a circuit element.

The voltage source for a shock from a CRT must be the CRT anode voltage. There is no other voltage source that is in the region of the CRT faceplate.

The anode of a CRT is the inside surface of the faceplate glass.

The anode voltage is regulated (constant) dc, with a variable ac current depending on the what is being displayed. If the display is black, then there is no ac or dc current, but voltage is present at the anode.

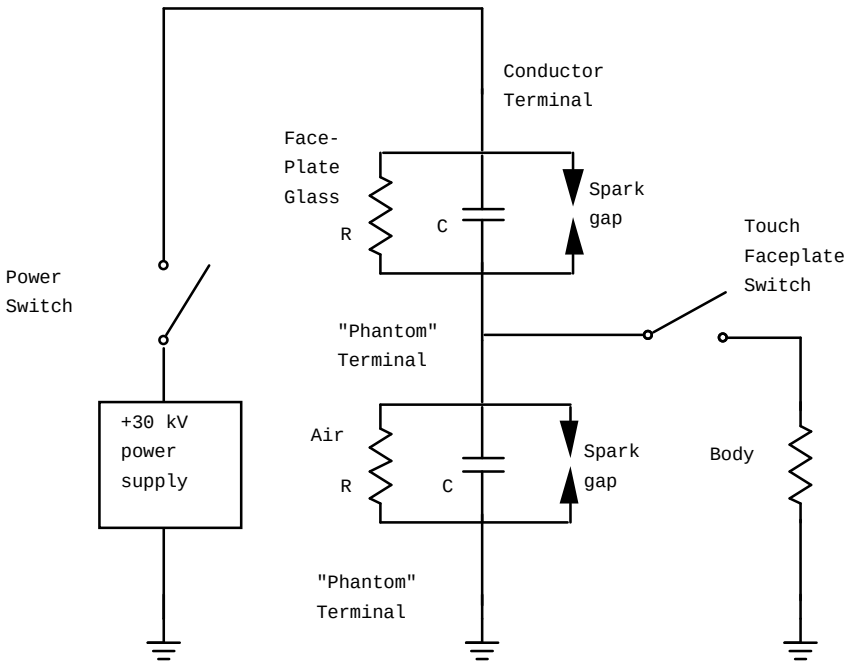
The circuit (without the body) is comprised of two insulators in series: One insulation is that of the faceplate glass, the other is that of air!

Circuit Analysis:
For the purposes of this analysis, we can ignore the insulation resistances of both the glass and the air. And, we can ignore the spark-gap of the glass. (The values of the glass insulation resistance and of the glass spark-gap are sufficiently high that they can be ignored.)

This leaves us with two capacitances in series, and a spark-gap in parallel with the capacitance of the air. For now, we will ignore the air spark-gap.

First, let's look at the relative values of the two capacitors. The dielectric constant of glass is about 6.5, and the dielectric constant of air is nearly 1. Assuming the areas and distances of the two plates of each capacitor are equal, then the capacitance of the glass is 6.5 times the capacitance of the air.

Next, let's look at voltage distribution of two capacitors in series. In a series circuit of two capacitors, voltage divides inversely according to the value of the capacitance. Since the air is the smaller of the two capacitors, then more voltage will



appear across the air than across the glass. If we assume the areas and distances of the two plates are equal for both the glass and the air, then about 87% of the voltage appears across the air, and 13% of the voltage appears across the glass.

This means that about 26 kilovolts is at the outer surface of the CRT faceplate!

Let's examine whether it is reasonable to assume that the two capacitors have plates of equal area and equal distance.

We assumed the plates of the capacitors are of equal area. Since the anode area is that of the entire CRT faceplate, then the glass "phantom" terminal area is equal to the anode area. Therefore the "phantom" terminals of the air are equal to that of the "phantom" terminal of the glass (which is equal to the anode terminal area).

We assumed the plates of the glass and air capacitances are of equal distance apart. CRT faceplate glass is about 1 inch thick. If we bring a small grounded object to about 1 inch from the CRT faceplate, we will note a crackling sound. This indicates a transfer of charge, which means a change in the capacitance in air. So, 1 inch of air is in the ball park.

If we presume the distance in air is two inches, then the voltage distribution is 76% across the air, and 24% across the glass. In this case, we still have almost 23 kilovolts at the outer surface of the CRT faceplate!

Electric Shock:
Now, let's examine what happens when someone touches a finger to the CRT faceplate.

In this system, the body resistance is very much less than the insulation resistances of the glass and air. So, we can treat the body as being a conductor of negligible resistance.

When a finger approaches the CRT faceplate, it displaces the air in the vicinity of the faceplate. This air, before the finger approaches the faceplate, is holding a charge. As the finger approaches the faceplate, the charge in the air being displaced by the finger AND the associated charge in the glass must be conducted to ground by the finger. Because the finger establishes the area of the plate of the capacitor, the charge conducted to ground by the body is very small and usually not detectable as an electric shock sensation.

In some cases, it is possible to detect a crackling sound as the finger approaches the CRT faceplate.

However, if a hand is placed on the CRT faceplate, the capacitance, being established by the area of the hand, is many times the area of the finger, and a very much larger charge must be transferred to ground. This larger charge often will result in the unpleasant sensation of electric shock.

If the body is insulated from ground when it touches the CRT faceplate, then the body replaces the air as the capacitor to ground. In this case, the body charges to some value of voltage. Usually, the body is near a ground such that an arc will occur from the body to the ground when the voltage is sufficient to overcome the breakdown voltage of air for that distance. This explains how an electric shock occurs from the ear to headphones or to a telephone.

Note, however, no matter what the shock mechanism, only one shock will occur. Once the air and glass are "discharged," they can only recharge by means of the insulation resistance of the glass. Since the insulation resistance of the glass is so very high, and the capacitance of the air so very low, the time to recharge the capacitance to a significant voltage is of the order of tens of hours.

Let's now look at what happens when the power is turned off.

If the charge at the CRT faceplate is left undisturbed while the high voltage was on, then, when the CRT anode voltage goes to zero, the charge at the CRT surface is drained through the power supply to ground.

However, if the charge at the CRT faceplate was drained while the CRT high voltage was on, then, when the CRT anode voltage changes from +30 kV to 0 volts, a negative charge is created at the surface of the CRT faceplate! Now, even though the power is off, if a hand is placed on the CRT faceplate, a shock may occur! This explains how an electric shock occurs when carrying a monitor.

Experiments and Measurements:
To confirm these explanations, we set up some experiments and measurements.

We taped some aluminum foil to the surface of the CRT. The foil was about 10 x 20 centimeters (the IEC 1010 standard area for a hand).

We used a 1,000-megohm, 3 picofarad high voltage probe and 100 megahertz scope to measure voltage and change in voltage.

When we turned on the monitor, the foil voltage went to 7 kilovolts, and then decayed to nearly zero, all in a period of 100 milliseconds. Clearly, the probe resistance discharged the capacitance.

We waited, and then again measured the voltage. If we waited a long time, tens of minutes, we measured voltages on the order of 600. At shorter times, we measured correspondingly lower voltages. Clearly, the charging time constant was very long.

Then, without the probe, we turned on the monitor, and brought the probe to the foil. We heard crackling, and had a corresponding display of transients, with the highest more than 8 kilovolts. From the shape of the discharge, we can surmise that the initial foil voltage was more than 16 kilovolts.

Again, without the probe, we turned on the monitor. This time, we brought a grounded probe to the foil, and incurred a 1-centimeter arc. Then we grounded the foil, removed the probe, and turned the monitor off. Again, we brought the probe to the foil and again we incurred a 1-centimeter arc.

We repeated the grounded probe experiments with several 1.5-square centimeter foils taped onto several positions on the screen (to simulate a finger-tip). As we brought the probe to each foil, we could hear crackling, but did not observe any arc.

Each foil behaved independent of the others. That is, if we discharged one foil, the others remained charged. This means that the surface insulates each incremental area from the adjacent area.

Calculations:
From the measurements and other data, we calculated the value of capacitance involved.

With the known resistance and capacitance of the high voltage probe, and with the peak voltage and decay time, we determined the total of the air and glass capacitances for a 10 x 20 centimeter foil at about 10 picofarads.

Using the published dielectric constant for glass, 6.5, and assuming a glass thickness of 1 inch, and using the 10 x 20 centimeter foil as the area, we calculated the capacitance of the glass at about 4 picofarads.

For such gross measurements and assumptions, we have reasonable agreement.

Hazard:
Is the CRT capacitive discharge injurious?

The shock is due to the high voltage and the stored charge. According to IEC 1010, for voltages above 15 kilovolts, the stored energy must not exceed 350 millijoules. If we assume 30 kilovolts, then the available energy from 10 picofarads (10 x 20 centimeter area) is 4.5 millijoules.

If we can believe that a 350 millijoule discharge is not injurious, then a 4.5 millijoule discharge is comfortably below the limit and should be non-injurious.

Nevertheless, the discharge can be felt, and is, to me, sufficiently uncomfortable that I prefer to avoid touching the CRT faceplate. If I do touch the CRT faceplate, I use my finger and approach the CRT faceplate slowly. (This bleeds the charge slowly and thus keeps the current below my level of sensation.)

Monochrome versus Color CRT:
One major difference between monochrome and color CRT is the anode voltage. Typical anode voltages for monochrome CRT are about 15 kilovolts. Typical anode voltages for color CRT are about 30 kilovolts.

With such a difference in anode voltage between monochrome and color CRT, it is rare that a capacitive discharge shock is experienced from the faceplate of a monochrome CRT.

Acknowledgements:
The originator of the insulation model used here is Ray Corson of Hewlett Packard's Loveland Instrument Division. The testing reported here was by Kevin Cyrus of Hewlett Packard's Vancouver Division.❖

EC GLOBAL
Continued from page 6

of the European Organization of Testing and Certification (EOTC), which held their first meeting on November 27, 1990. Countries outside of the EC, who are supplying goods into the EC (Third Countries) have been offered participation in the Notified Body process, in the Council Resolution (90/C 10/01). If the U.S. wishes to establish indigenous Notified Bodies, petitions must be made to the Commission from our Public Sector and each U.S. Notified Body will have to agree to reciprocity with all the other Notified Bodies. It is recommended that Notified Bodies be assessed against EN 45000 series standards; however, it is likely that by 1992 this criteria will be prerequisite for Notification.

The "CE" mark is the European Community symbol of compliance to EC Technical Directives and is specified for use in all "New Approach" Directives. Through this legislation it's use is mandatory on all commodities supplied to the EC Single Market, as part of the suppliers Declaration of Conformity. The "CE" mark does not apply to any one product law, but to all New Approach Directives which impact a given commodity. The supplier must be certain that he meets all the pertinent New Approach Directives, before applying the "CE" mark on his product. The EC Commission is drafting a Directive on the use of the "CE" mark, which should be published next year.

In conclusion, the operation of COM(89) 209 and the general conformity assessment criteria for the technical aspect of the EC Single Market is still quite vague; many details of process must be addressed before 1992 years end. But, companies who are supplying product into Europe at present cannot wait for clarity in the Global Approach, for concise and explicit method of action may not be realized even beyond the commencement of EC 92. Corporations worldwide who are marketing in Europe, must develop strategies now.

Pursuit of company certifications should be considered, whether it be Quality System Registration (EN 29000) or Testing Laboratory Accreditation (EN 45000), or both. These certifications apply to the company system or process and are fundamental tools for operating the Conformity Modules. The modules are the keys to the correct use of the "CE" mark and suppliers Declaration of Conformity, the perceived technical locks on the doors of the EC Single Market.❖

AREA ACTIVITIES
Continued from page 7

IEC power supply standards, Amendment A to IEC 950, information on EN 41003 (the draft standard for telecom equipment), new magazines and seminars, a new international symbol for hot surfaces and some CRT requirements. A short discussion followed, concerning the implementation of IEC 555 for personal computer type products.

The presentation by Dave MacKenzie of Microsafe Systems was on current methods for designing safety into the hardware and software of computer controlled systems. A few dielectric tests and spacings measurements after the design is done is <u>not</u> the way to go!

The next meeting is on February 6, 1991, at Hewlett Packard in Rancho Bernardo. Konrad Kobel of TÜV America plans to speak on the current status of European common market harmonization as we approach EC92. Plan to reserve the first Wednesday of each month for other popular topics related to product safety. See you there!

Santa Clara Valley :
The war in Iraq can be blamed for one more disturbance in our lives. The program originally planned for January - a presentation about NEMKO, the Norwegian product safety agency, and their program "Testing By the Manufacturer" - had to be postponed. The scheduled speaker, Mr. Leif Nybro of NEMKO, never left Norway after the war broke out. Fortunately, he will be able to come to California in February if the situation for trans-Atlantic flights remains calm. SCV Chapter members are advised to watch their mail for the meeting announcement.

An able replacement on VERY short notice was Doug Anderson of Underwriters Laboratories Follow-Up Services Department in Santa Clara. He gave an overview of the new UL certification program for the ISO 9000 Standards for Quality. UL auditors are being trained by BSI, which is probably the leader in this field. A short UL publicity videotape explained a little about the reasons and procedures for the ISO 9000 program, although it was long on scenic European views and clas-

sical music and short on details. Doug estimated that a simple ISO 9000 certification would start at about $6000, but an additional preliminary visit might be worthwhile.

We will have a Special Meeting featuring NEMKO in February. Following that will be March 26 and will feature a speaker from UL on the topic of the UL Standard for Telephone Equipment, UL 1459.❖

LETTERS
Continued from page 3

(l) All supply circuits connected together (see Section 1.4.2.2(4));

(2) All exposed parts including the grounding connection points, excluding terminations for connection to other telecommunication equipment;

(3) All telecommunication connection points, other than ground, to other telecommunication equipment connected together (see Section 1.4.2.2 (3)).

1.4.2.2 METHOD OF MEASUREMENT

Dielectric test voltages shall be applied in accordance with Section 2.2.1. The test voltages shall be from a 1000 V 60 Hz source limited to 25 mA. In the case of generic lAl/lA2 KTS, the test current may be limited as specified in Section 2.2.2(1)(b). These tests shall be conducted in a normal operating environment.

(l) Intentional conducting path(s) to ground may disconnected for the tests specified.

(2) Electrical breakdown is considered to have occurred when the current, which flows as a result of the application of the test voltage, rapidly increases in an uncontrolled manner, i.e. the insulation does not restrict the flow of current.

(3) Connection points (to other telecommunication equipment) that are intended to be conductively connected through the equipment under test from the telecommunication network shall be excluded from this test. However, the equipment intended to be connected to these excluded connection points shall be tested separately, according to this standard.

(4) Supply circuit interfaces that are intended to be conductively connected through the equipment under test to the telecommunications network connections or exposed metal surfaces shall be excluded from this test. However, such supply circuits shall meet the requirements of this standard.

1.4.2.3 ENGINEERING ANALYSIS

An engineering analysis of those parts of the TE that are subject to compliance with Section 1.4.2.1 shall be performed. This shall be attested to by an engineer who is licensed by a Canadian Provincial Association of Professional Engineers. This analysis and attestation shall form a part of the test report.

This engineering analysis shall demonstrate that good engineering practice has been followed in the design, component selection and assembly throughout those portions of the TE that are intended to provide hazardous voltage isolation between the network interface and the connection points specified in Section 1.4.2.1 (1), (2) and (3). Components and materials used in the construction of the above parts of the TE shall be shown to be suitable for the intended application. The assembly shall be such that the dielectric strength requirements of Section 1.4.2.1 will continue to be met when the TE is subjected to the normal stresses of handling and use. The applicant shall satisfy the Department that he has sufficient quality control to ensure a uniformity of production such that all units comply.❖

Area Activities

	February	March	April
Central Texas Vic Baldwin (512) 469 7289 David Staggs (512) 343 3751	No Meeting Scheduled	Thursday, March 21, 8PM "ANSI C63.4 - Replacing FCC MP-4" by Ed Bronough, EMC Society President Location: Peppers at the Falls, San Marcos	Thursday, April 25, 8PM "Safety and EC92" by Jim deVries of TÜV Rheinland Location: New Braumfels
Chicago Dick Hagedorn (708) 505 5722	No Meeting Scheduled	No Meeting Scheduled	Call for information
Orange County Southern California Filenet Corp. 1550 Scenic Ave. Costa Mesa, CA Ercell Bryant (714) 966 3459	Tuesday, February 5, 6PM "Software Safety Testing for Safety" (Medical; applicable to other categories) by Dave MacKenzie	Tuesday, March 5, 6PM Discussion on CBEMA meeting	Call for information
Portland PGE Co. 14655 SW Old Scholls Ferry Rd Beaverton, OR 97005 Fran Pelinka (503) 641 4141	Tuesday, February 19, 6PM "Europe 1992 and ISO 9000" by Burk Brandt, TÜV America	Tuesday, March 19, 6PM Subject TBD by Bob Pollock, UL	Tuesday, April 16, 6PM Subject and Speaker TBD
San Diego HP Cafeteria 16399 West Bernardo Rd. Rancho Bernardo, CA Scott Bonnet (619) 592 4571	Wednesday, February 6, 6pm "EC Harmonization" by Konrad Kobell of TÜV	Call for information	Call for information
Santa Clara Valley Apple Computer Inc 20705 Valley Green Drive Cupertino, CA John Reynolds (408) 764 5841	Tuesday, February 26, 7PM Special meeting "Testing by Manufacturer" by Leif Nybro of NEMKO	Tuesday, March 26, 7 PM UL 1459 (Telecom) by a speaker from UL	No regular meeting scheduled.
Seattle John Fluke Mfg., Co. 6920 Seaway Blvd. Everett, WA Walt Hart (206) 356 5177	Wednesday, February 20, 6PM "Europe 1992 and ISO 9000" by Burk Brandt, TÜV America	Wednesday, March 20, 6PM Subject TBD by Bob Pollock, UL	Wednesday, April 17, 6PM Subject and Speaker TBD

Institutional Listings

We are grateful for the assistance given by these firms and invite application for Institutional Listings from other firms interested in the product safety field. An Institutional Listing recognizes contributions to support the publication of the *Product Safety Newsletter* of the IEEE EMC Society Product Safety Technical Committee. Inquiries should be send to: PSTC *Product Safety Newsletter*, C/O John McBain (M/S 42LS), Hewlett-Packard, 19447 Pruneridge Avenue, Cupertino, CA 95014.

Product Safety Technical Committee Election Statements by Candidates

Chairman:

Brian Claes - I believe the role of the chairman is to lead the Product Safety Technical Committee in achieving its stated goals, especially:
* Enhancing the practice of product safety disciplines, partially through exposure to other safety related disciplines.
* Increasing cooperation with other IEEE Societies whose members are involved with aspects of product safety.
* Taking a more active role in developing and improving standards.
* Supporting the development of existing and emerging local product safety groups associated with the PSTC.

My background includes a BSEE (CSUF, 1973) and an MS in Safety (USC, 1985). I am a Registered Electrical Engineer (California) and certified in Product Safety by the Board of Certified Safety Professionals. After five years at Underwriters Laboratories as a project engineer, I went to National Semiconductor as a safety/EMC/product assurance engineer. The last twelve years at Tandem Computers started with establishing the product safety/EMC group. I have since been involved with various engineering and program management roles in the areas of product safety and quality.

I am asking for your support.

Vice-Chairman:

Tony Nikolassy - I have been heavily committed to Product Safety as a profession for at least 15 years at various companies. This commitment has brought a hard earned reputation for knowledge and capability in emissions, ergonomic and safety design engineering. I feel that I can now contribute to the growth of the Product Safety Technical Committee and would like to be given the opportunity to do so.

Besides being a member of the IEEE and the EMC Society, I have been very active in the Boston-area product safety group. A brief employment history that may give a feel for my product safety and managerial experience includes: 1987 to present, Manager of Corporate Product Safety Engineering, Wang Laboratories, Inc.; 1985 to 1987, Manager of Regulatory Compliance Engineering, CODEX, Inc. (Subsid. of Motorola); 1969 to 1985, positions from electronic technician to staff engineer, Mohawk Data Sciences, Inc..

I would like to ask for your support of my candidacy for the office of Vice-Chairman of the Product Safety Technical Committee.

Rich Pescatore - My tenure as Chairman has provided a great learning experience and has been a pleasure. I have served this organization from its inception. Witnessing the organization's growth and development has been rewarding. It is now time to step aside and let someone else bring new ideas and energy to the group. However, it is also important to maintain continuity.

With this in mind, I would like to offer my nomination for the position of Vice-Chairman. I can help your elected chairman achieve his goals without the burden of having to relearn what your present officers have experienced these past few years. I will certainly do my best to advise the new administration how to avoid the pitfalls that I discovered as Chairman.

If you are pleased with the leadership that I brought to the organization as your Chairman, please vote for me as your next Vice-Chairman.

Secretary/Treasurer:

John McBain - It has been hard work, but enjoyable, participating in the Product Safety Technical Committee. I have several goals I would like to continue to pursue as Secretary/Treasurer.

First, the *Product Safety Newsletter* should become stronger, both technically and financially. This will let it be the forerunner of the technical journal that we will publish after becoming a Technical Council. Second, support of other IEEE Societies should be sought to form a Technical Council for Product Safety. The EMC Society Board of Directors has already formally approved that goal at their August, 1990, meeting. Third, standards activities should be increased and formalized during the next year. Fourth (or perhaps first!), more participation by other individuals is urgently needed to achieve the other three goals.

I would like your support, not just by voting for me, but in volunteering to join me and the other PSTC Officers in creating an outstanding organization for product safety professionals.

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PSTC Officers - 1991 Ballot

Vote for one person for each office by marking the box in front of the name. You must be a member of the IEEE and of the IEEE EMC Society to vote.

Chairman:

☐ Brian Claes

Secretary-Treasurer:

☐ John McBain

Vice-Chairman:

☐ Tony Nikolassy

☐ Rich Pescatore

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