Can / Am EMTP News

Voice of the Canadian / American EMTP User Group

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Salford Compiler and DOS Extender

Parameter KTRPL4 of STARTUP indicates not only the MS-DOS disk drive being used, but also, by means of an appended sign, whether or not output file naming is parallel to the input data file. For years, parallel naming has been recommended and used. So, it was no great surprise to learn from Masahiro Kan of Toshiba Corporation in Japan that the alternative failed. In E-mail dated January 12th, typical overflow of DBOS was reported for a case of positive KTRPL4: *"Out of memory - increase the size of your paging file ..."* The problem was quickly confirmed and traced to zero variable KOLDOT in SYSDEP when KTRPL4 was positive. Execution died handling bytes (1:0) of a character variable. Apparently DBOS ver. 2.66 is unprotected from such obviously-illegal usage. Correction using new KOLDSV was made the following day. Duration of the trouble seems to be around a year. Mr. Kan correctly surmised that the .DBG file to replace older DEBUG.LIS (see the April, 1997, newsletter) involved a tricky limitation.

HP-GL output of a Fourier bar chart was added December 14th in response to a report that it was missing. Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina, had noted the lack in public E-mail five days earlier. He was using FOURIER ON to produce spectral decomposition instead of the usual time plot. While the screen display was believable, disk file ATPHPGL.001 (the output file if NOHPGL is zero) contained just a little text --- not the all-important vertical bars and their associated labeling (a harmonic number below each bar and a floating-point number above the tallest bar). As originally coded, the bars were produced within a Salford-dependent subroutine DRWBAR that produced nothing but screen output. Although Mr. Hevia complained about HP-GL only, in fact PostScript also should be missing. So, restructuring was undertaken. Salford graphics were forced

one module lower, down into a new subroutine SCRBAR that now is called at the end of DRWBAR, which has become universal by virtual of reliance upon the CALCOMP PLOT interface. Bars are drawn as empty rectangles --- the best one can do using the present universal graphics. The sole purpose of Salford SCRBAR now is to color the insides of those vertical bars. HP-GL output has been verified using MS Word 7 for the first Fourier output of DC-42 (disk file FOURIER.DAT).

Salford DBOS version 3.5 does **not** require MS Windows, fortunately. This conclusion was stated in E-mail dated January 20th from your Editor to Stu Cook of JUST Services in suburban Montreal, Quebec, Canada. Mr. Cook, working with a DOS emulator for Apple Macintosh, had only partial success with Salford DBOS. Studying Salford documentation, he had noted what seemed to be a requirement of Windows. About *"the README file in the DB3P50 directory,"* he reported the following in E-mail dated January 4th): *"I see that it says in Section 4 under system requirements, 'Please ensure that you have a 80386-based PC or PS/2 system running MS Windows 3.0 or later.' Further in point 6 under installation instructions, 'You will then be asked if you want to update your Windows 3 SYSTEM.INI file in order to use the WDBOS.386 virtual device driver.' The flavour of VPC that I bought was the rock bottom one with only PC DOS 7.0. Other flavours have either MS Windows 3.11 or MS Windows 95."*

Improvements to Salford TPPLOT

NOBARS is a new binary switch that has been provided in order that a Fourier-like bar chart of frequency response can be ordered. This would be for any one variable of a .PL4 file that has been produced by either FREQUENCY SCAN (FS) or HARMONIC FREQUENCY SCAN (HFS) execution of ATP. Parameter NOBARS is accessed by integer index 276 for TPPARAM.DAT use. The default value is unity, which will result in conventional plotting (not a bar chart). So, if the user has connected the .PL4 file of a frequency scan, and if he does want a bar chart, he must toggle this switch to zero. Rather than place such a request in TPPARAM.DAT where it might be forgotten (and in any event would need to be removed later), the savvy user who is assembling plot commands in a disk file probably will prefer to use SET NOBARS=0 prior to the plot request. January 6th is the date such operation began. Note the advantage of TPPLOT over ATP for Gabor Furst's HFS cases: the user can choose between two types of display. With ATP batch-mode plotting, the bar chart is the only alternative. Both alternatives are illustrated by @FURST which displays data from FURST.PL4 (both files can be found in the TPPLOT.ZIP archive).

HP-GL output of the harmonic bar chart was modified January 12th when the previously-hollow bars were filled. This progress was based on the same technique of Orlando Hevia that earlier was applied to batch-mode ATP plotting. Disk file FURST.HPG of the TPPLOT archive illustrates the improved output that is produced by command file execution @FURST

FREQUENCY SCAN or HARMONIC FREQUENCY SCAN supported FMTPL4 = widexx beginning January 18th. This is explained in a separate story. At the same time ATP was changed, TPPLOT required change. This is because the first column of header lines now created by ATP for an FS case differs from one created by simulation. Previously, only *Second* was searched for in the first heading line. Now, *Freq* (the alternative) also is looked for, to determine whether or not the three heading lines are present.

.PL4 files having FMTPL4 = 10E10. (note the trailing period in the 6th of 6 bytes) were incompatible with TPPLOT prior to January 23rd. Three days earlier, E-mail from Mr. Hevia had reported a problem, which was quickly and easily confirmed in Portland. For years, Salford EMTP has been able to create such a .PL4 file, yet no one ever reported trouble using TPPLOT on such a file. The trouble was serious, all right: a DBOS error termination as plot points are read. Mr. Hevia reported: *"Digit(s) expected at User/7FA1AAA2 ..."* Not surprisingly, Prof. Kizilcay's PCPLOT was reported to behave similarly: *"PCPLOT and TPPLOT refuse the .pl4"*

News from Outside USA and Canada

A Korean MS Excel file may be incompatible with English MS Excel. Remember how Korean MS Word files were found to be incompatible with English MS Word (October, 1997, newsletter)? Well, the consistency of MS incompatibility with itself seemed to spread from Word to Excel on January 15th when the same Dong-Hak Jung of KERI (Korea Electrotechnology Research Institute) in Changwon attempted for send an MS Excel file attached to E-mail. The deMIMEing using MUNPACK was uneventful, producing ATP-LIC.XLS within d:\email of Dr. Tsu-huei Liu's Pentium at BPA. But then Excel Version 5.0 for Windows NT (4.0 as used by Dr. Liu) rejected the file with error message: *"file format is not valid."*

BPA's Dr. Tsu-huei Liu addressed some 65 participants at a workshop of the Japanese EMTP Committee (JEC) in Tokyo, Japan, on March 13th. Details next time.

"China moves to restrict use of the Internet" is the headline of a story from the New York Times News Service that was printed on page A7 of *The Oregonian* dated December 31st. *"China on Tuesday adopted elaborate new rules restricting use of the Internet .... The new rules spell out in more detail than before the government's definition of computer crimes, which include use of the Internet to defame government agencies ..."* About the volume of

usage, one learns: *"At the end of October, 620,000 Internet subscribers had been established .... Many of those accounts are shared by 10 or 20 people, though a growing number of people have computers at home and may pay more than $200 to establish a personal account."* More next issue. Information about economics has been received from Chinese who are working or studying overseas.

More about Electronic Mail (E-mail)

Cookies were mentioned in the October, 1997, issue. A large story about nothing else began on page D1 of the February 10th issue of *The Oregonian*. By Mike Francis, the subtitle of this story explains: *"The practice of placing data files on hard drives during Web site visits causes controversy among Net surfers."* What is a potential danger? *"An unscrupulous Web-site operator could implant a cookie to silently track your online movements and report them to advertisers and scam artists. ... this means you may get more targeted online ads than you bargained for."* Here, *targeted online ads* would seem to be a euphemism for junk mail. Among recommended addresses for more reading is **www.netscape.com** which *"has an extensive list of frequently asked questions about cookies. Find it by selecting the Search command for the site and typing cookies."*

Acer is the brand name of a computer that is made in Taiwan. Like most vendors these days, Acer operates a Web site. December 18th, your Editor received notification of mail from this site as follows: *"Dear [Scott Meyer]: Hi! This is an automatic message from CDX at AcerMall -- The Largest Chinese Cyber Mall in the World. [Chung-liang Chang] (u066035@taipower.com.tw) has sent you a musical postcard! You can get it at: http://card.acer.net/cgi-bin/card/getcard … Your postcard will expire after one month."* BPA's Dr. Tsu-huei Liu received a similar message from Taiwan Power Company, and she investigated. In the process, by a few clicks of the mouse, she updated her WinNT copy of MS Explorer to handle Chinese language. The extension was free of charge.

Web surfing is common at work. But is it common **for** work? Not very, if a clandestine survey of the largest regional office of Oregon's Department of Environmental Quality (DEQ) is any indication. *"Staffers surf Net for personal use, DEQ reports"* is the headline on the front page of *The Oregonian* dated December 18th. *"A DEQ department manager, after sorting through nearly 200 pages of monitoring printouts and more than 8000 visits to Web sites ... drew the following conclusions: * Of all material viewed by workers, 8.5 percent was probably or definitely work-related, 18.9 percent could not be easily determined, 5.9 percent probably was not work related, 65.6 percent was definitely not work-related, and 1 percent was 'totally inappropriate' "* (usually a euphemism for pornography, but it could be anything that is not politically correct). About Web searches, some were used for work. *"But more involved information .... such as stock and investment pages, discount airline fares, the 'Dilbert' comic strip, horoscopes, hockey news, mountain man history, information on pottery and antiques, the official 'Star Wars' Web site, how to file for bankruptcy, sites devoted to actresses Pia Zadora and Julia Roberts, and information on joint child custody and life after divorce."* But what is appropriate, and what is not? How does one know beforehand, rather than after the fact? *"Several employees were concerned whether they could be told what content they could view on the Internet, provided that they went online on break or lunch time. He said union representatives were discussing that issue with managers."* Thanks to the Web, employee games have become much more sophisticated. The banning of computer games no longer is as simple and clear-cut as it once was. As for Dilbert, he is patently subversive, obviously undermining the authority of, and respect for, management. That is what makes him and his friends (Wally, Dogbert, etc.) so popular. Everybody at BPA knows that! In the time of Shakespeare, intelligentsia communicated with their management (the King or Queen) via carefully-disguised lessons in plays. Today, government workers with secure jobs communicate with their management via photocopy of Dilbert comic strips, or Dilbert calendars!

"Egghead computer store closing!" is the headline of a half-page advertisement on page A14 of *The Oregonian* dated January 29th. At the bottom are found addresses and telephone numbers of six stores in Oregon. What was happening? It seems Egghead has struggled during recent years, and sees the Internet as possible salvation. A story on page E1 of the same newspaper has headline: *"Egghead will move all sales online."* The sub-headline explains: *"The software company plans to close its remaining 80 stores and shift its retail business to the growing online market."* The hope is to reduce cost, of course: *"Egghead plans to lay off about 800 employees and keep 200 to run the Internet business. Its new name will be Egghead.com."*

Disgruntled consumers are using Web sites to express dissatisfaction with inferior services of companies. This according to a story by Robin Stansbury of the *Hartford Courant*, which was reprinted on page C2 of *The Seattle Times* dated December 28th. *"These days, a search for many companies on the Web …will turn up these 'anti' Web sites, where consumers freely post their customer-service horror stories. .... There are such pages as You're in Bad hands with Allstate, Prudential Misled Me and Down with Snapple."* For foreign readers who are not familiar with such American names, Allstate and Prudential are large American insurance companies, with the former using the slogan *"you're in good hands with Allstate."* As for Snapple, this is a relatively-new soft drink. Some businesses are concerned by the bad publicity. *"New companies are being created to monitor the Web and give corporations a chance to respond to such criticism. Already, the New York company eWords! helped Mrs. Fields Cookies dispel a rumor that the company was*

donating goodies for an O. J. Simpson victory party. Clients of eWorks! ... pay $295 to $645 a month for the monitoring service called eWatch."

Brokers who sell stocks could not satisfy the demand of Web-connected customers during the free-fall of prices October 27th. One of two separate stories on the subject appeared on page B1 of *The Oregonian* dated December 27th under the headline *"Brokerages beefing up Net offerings."* Plans for expansion have been accelerated: *"All are spending heavily to beef up their hardware or enhance their software. Capacity-expansion projects that were originally slated to be phased in over many months are being rushed into place. The companies have to do it to restore customer confidence. They realize the future of Internet trading is at stake."* ETrade Securities may have been the innovator, but Charles *"Schwab controls about 33 percent of the online trading market, compared with ETrade's second-place share of 15 percent ..."* How big was the October surge? Schwab, *"with an average of 100,000 trades a day, processed 300,000 Oct. 28."* As for the source of money, it is changing. More than just stocks are being sold via Web pages these days. According to an ETrade officer, *"By 2000 ... the company could draw as little as 20 percent of its revenue from stock commissions, compared with about 65 percent now."*

Live radio broadcasts are being fed to the Internet by AudioNet of Dallas, Texas. Heavy advertising has been heard on Portland's KBNP during the past year, and background was summarized in a story that began on page E6 of *The Oregonian* dated March 19th. AudioNet is described as *"the biggest site of its kind on the World Wide Web, carrying continuous live programming from more than 260 radio stations around the world, including the BBC World Service. Also available are broadcasts of thousands of professional and college sporting events … as well as live concerts and club performances."* How long has this been going on? *"Back in 1995, AudioNet started out with only one radio station."* What is the future? Pictures (television), of course. *"In January, Dallas-Fort Worth station WFAA became the first local television station to put live programming on the Internet …"* About capacity: *"AudioNet has invested about $5 million to build a network that can accommodate 500,000 listeners at a time …"* But what are the economics of use? Nothing was said about cost of usage, if any. Do advertisers pay all costs of the operation?

North Korea has a Web page, even if it is in Japan. This interesting detail was found in the third story on page 10 of the March 8th issue of *Parade* magazine. This is a regular feature entitled the *Intelligence Report.* The story ends with an explanation that North Koreans *"are not allowed personal computers."* Kim Jong II is the ruler, and **www.kcna.co.jp** has provision for sending him E-mail. However, *"Kim is technologically challenged himself. The collected e-mail is sent to him by fax."*

"Online mortgage shopping" is the headline of the main story on page H1 of the March 8th issue of *The Oregonian.* This complements the story about real estate listings in the April, 1996, issue. For the average buyer, it does not do much good to find the right home if one can not obtain a favorable mortgage to finance the purchase. *"Information is available around the clock, around the world"* is the subtitle of the story. An illustration appears in the first column: *"Robert J. Hogg, president of Qpoint Five Star in Lake Oswego, said his online customers have included two Nike employees working in Korea who wanted to take advantage of low interest rates to refinance their homes. They completed the entire application process online. The closing documents were sent to them by Federal Express for their signatures."* For more information, investigate Qpoint's Web page **www.qpoint.com**

"War against spam escalates" is the title of a *New York Times* story that appeared on page C1 of the March 17th issue of the *Seattle Post-Intelligencer*. Involved is Eric Allman of the San Francisco Bay area, and his program named Sendmail, which is described as *"the electronic post office used on about 75% of the computers that route e-mail messages to their proper recipients on the Internet."* Coming in Version 8.9 are what are called *anti-spam tools.* About size of the problem, spam is *"now estimated to account for about 10 percent of all e-mail worldwide."* Blocking spam is more complicated than the rejection of mail from known addresses : *"most spammers hide their e-mail addresses to make it more difficult for irate computer users to retaliate."*

Argentine EMTP User Group

The Argentine user group CAUE (Comite Argentino de Usuarios del EMTP) has approved a summary of its history and operation. The following began as English text dated March 29th that was submitted from Buenos Aires by Jorge A. Nizovoy, the Coordinator of CAUE. The story is long, but also inspirational. It will be told in its entirety, with all comment delayed until the following issue.

The Argentine Committee of EMTP Users (CAUE) is an informal and nonprofit association constituted of 56 institutions interested in the digital simulation of electric power system transients. Its objectives are: 1) to ease the distribution of free programs among its members; 2) to encourage the free interchange of experience, software and documentation; 3) to encourage training, to inform about its activities and international news, and to promote more extensive and better use of internationally prestigious free programs for the digital simulation of electromagnetic transients; and 4) to represent its members in front of similar organizations elsewhere in the world.

Members include the most important companies transmitting and distributiing electrical energy, universities, electromechanical assembling companies, equipment

manufacturers, and administrative and regulative entities of the wholesale electrical market of Argentina.

CAUE was created on July 3rd 1985 in response to a suggestion by the Coordinator of the Latin American Committee of EMTP Users (CLAUE), Mr. Marco Polo Pereira of FURNAS in Rio de Janeiro, Brazil. At that time, the distribution of BPA's EMTP in Argentina was involved. Previously, it was common for one person to request free programs and handbooks from another country even though neighbors already possessed the information. Sometimes this was because the person making the request didn't know his neighbor already had the information; at other times it was because neighbors jealously guarded the program and information as valuable personal secrets.

The organization was created by means of a simple act signed by its 7 founding members. The administration of CAUE was to be without cost to members, although fees could be charged to reimburse costs of making and distributing copies of the information. Because the task of administration required working hours and communication costs, nobody wanted to assume the role of coordinator unless his company would support the activity for reasons of enhanced institutional prestige.

Traditionally, Argentine public electrical companies and universities have not had adequate resources to support such activity, so the coordination always has come from a private company. In order, these have been: 1) SADE (a company of engineering and electromechanical assembly): Mr. Jorge Tettamanti (1985-1986); Mr. Carlos M. Ezeiza (1987 -1990). 2) TECHINT (idem previous): Mr. Alfredo Rifaldi (1991-1994). 3) TRANSENER (High Voltage Transmission Company of Argentina, privatized in 1993): Mr. Jorge Nizovoy (since June 28th, 1994).

CAUE's founding act requires four meetings each year. Since 1995, these meetings have consisted of two parts: 1) administrative activities (reports, news, and determination of purposes and tasks); and 2) a technical meeting in which one topic of general interest was developed by some professional of recognized experience. An open discussion would follow the exposition.

Training has been approached by CAUE from two distinct points of view. The first concerns new ATP users, and the second involves more experienced users. These shall next be summarized in some detail.

The Santa Fe Regional Faculty of the National Technological University has been an active member of CAUE since 1994. Headed by Professor Elbio Pablo Vaillard, this group has been developing a practical introductory course of ATP usage that lasts three days. Included are installation of the program, the creation of simple data cases, graphic display of results, and overall explanation of ATP and programs associated with it. After the course, students can ask for help whenever they might need it, and they can even obtain a certificate of accomplishment if they submit to their teachers work that demonstrates practical application. Limiting class size of 24 students has always been attained. In fact, demand was so heavy in 1996 that the course was taught twice.

For experienced users, national symposiums were held in 1987 and 1990, and a third has been scheduled for November 26th and 27th of this year. In 1995, an advanced course was taught to 31 students by eight outstanding professionals of CAUE --- six from Argentina and two from Uruguay. Finally, in 1997, at the request of CAUE, the National University of La Plata, a pioneer in Argentine analysis of overvoltages and insulation coordination, reopened a course that had been discontinued for several years. Concerned with a reinforcement of theoretical concepts, the old course has been improved by the addition of modern simulation tools. Nowadays, with programs such as ATP readily available, access to computer analysis no longer is a problem. But proper use of that analysis in an engineering sense remains a concern of CAUE.

The Internet has had an important and positive influence, effectively shortening distances and eliminating isolation. The CAUE home page on the Web (WWW) is designed and maintained by Mr. Raul Bianchi Lastra of National University of La Plata, whose service has been of extraordinary value to CAUE and its members. The CAUE home page offers practically-instantaneous interchange of information among Argentine users as well as explorers from other countries. CAUE activities are visible to all, and everybody knows who we are (included is a list of ATP-licensed users in Argentina). There is a place where users can read answers to recently-stated problems, too. Users save time, and are encouraged to make their own contributions: papers, programs, useful documentation, and -- why not? -- a little humor.

Mr. Orlando Hevia of the regional campus in Santa Fe recently has, using E-mail, established an important working relationship with ATP developers in Portland. This, in turn, has provided important encouragement for other CAUE members. Mr. Hevia's latest preoccupation has been a new interactive plotting program that soon should be available for beta testing by others.

Another achievement of which CAUE is proud is the enthusiastic collaboration of Mr. Raul Bianchi Lastra with Mr. Marco Polo Pereira of Brazil and Prof. Juan Martinez Velasco of Spain. The three are publishers of a new *ATP Ibero-American Magazine*, which first appeared in March of 1998. This is the outgrowth of a project that emerged from the 1997 EEUG Meeting in Barcelona: publication of technical articles in Spanish and Portuguese using the CAUE home page. The goal was an active interchange of experiences between transient specialists of the two related languages. The first magazine issue includes three articles, and it is hoped that quarterly publication might be attained.

Even though the present seems good, it must be noted that CAUE has, in the past, lived through periods of uncertainty. From overseas, first there came reports of an end to BPA's free distribution of EMTP during the middle '80s. Later came news of the closure of LEC in 1993. Internally, public electrical companies of Argentina were privatized during 1992 and 1993, resulting in a disruption of membership and altered priorities that emphasized economic and regulatory matters rather than technical ones. However, these difficult experiences have helped to consolidate CAUE's *Common Law* in irrefutable concepts such as cooperation, solidarity and altruism.

CAUE appreciates the cooperative, noncommercial spirit of ATP development and usage as advocated by Drs. Scott Meyer and Tsu-huei Liu of the Can/Am user group. Their efforts to encourage open and free participation of others is frequently cited at meetings as a model. Also mentioned are the constant and generous cooperation of Mr. Marco Polo Pereira of CLAUE and Argentine personalities such as my predecessor, Mr. Alfredo Rifaldi, whose life has been devoted to altruistic work. All are symbols of utopian ideals that are in unfortunately short supply nowadays.

Quantity of members is not a problem today. In fact, as large public companies were privatized, they were divided into smaller private entities. Along with promotional work by CAUE, membership increased from 16 to 56 over a 6-year period. Our greater problem today is the reduction of spending that some of the new companies are compelled to implement. It remains necessary to emphasize to members the importance of specialization, and its effect on real costs. Although the number of members has grown greatly, the number of active users with considerable experience remains constant at about ten professionals.

Needs of CAUE have traditionally been well satisfied by Mr. Marco Polo Pereira of CLAUE in Brazil. Fortunately, at present, CAUE now is able to help him with requests from Argentina's other neighbors (Uruguay, Chile and Paraguay). As an example of cooperation between South American countries, Marco Polo Pereira, Raul Bianchi Lastra and the CAUE Coordinator are offering twelve *"Sessions on Transient Phenomena in Electrical Power Systems"* next October 20th to 23rd at the Catholic University of Valparaiso in Vina del Mar, Chile. We hope, in this way, to continue spreading ATP and the cooperative spirit related to it.

ARMAFIT by Taku Noda

This is a continuation of the same story in the preceding issue. It provides more information about the frequency dependence of Dr. Taku Noda. ARMAFIT is his fitter. The following paragraph involves some restructuring of Masahiro Kan's insertion of Dr. Noda's writing:

"ARMAFIT is a DOS application, but compiled by a 32-bit native compiler, and thus it does not have the limitation of 640 KB. In this distribution, six self-documented, illustrative examples are included: 1) sample1s.aft for modeling of the admittance of an LCR circuit with an s-rational function model; 2) sample2s.aft for modeling of the admittance of an iron-core reactor with an s-rational function model; 3) sample3s.aft for modeling of the voltage-transfer function of a transformer with an s-rational function model; 4) sample1z.aft is same as sample1s.aft, but with an ARMA model; 5) sample2z.aft is same as sample2s.aft, but with an ARMA model; 6) sample3z.aft is same as sample3s.aft, but with an ARMA model. Type 'ARMAFIT -?' for help."

Noda frequency dependence was imperfectly isolated from data that involved no such representation. Dr. Yuan Bin, A. Prof. at Tsinghua University in Beijing, China, should be credited with first providing an illustration of the problem to program developers in Portland. This was in E-mail dated February 23rd. An error was discovered at the top of OVER13, and was corrected the following day. Efficiency for non-users of Noda F-dependence was improved at the same time.

Smooth Saturation by Orlando Hevia

This is a continuation of the same story in the preceding issue. It continues to explain the smooth (as opposed to piecewise-linear) alternatives for magnetic saturation that have been developed by Orlando Hevia of Universidad Tecnologica Nacional in Sante Fe, Argentina.

NOPOST equal to unity means that no PostScript output of batch-mode plotting is desired. Prior to correction on January 5th, this suppression did not work correctly for SSUT plotting, however. As pointed out by Mr. Hevia in E-mail dated January 3rd, execution was interrupted by DBOS following the screen plot because of an attempt to write to an I/O unit that was not connected to a file.

The .GNU output for GNUPLOT display of SSUT involved two plots where only one was desired. There was one for the analytical function and a separate one for the data points. This mistake was pointed out on January 3rd in E-mail from Orlando Hevia. A correction was made two days later. After less-than-satisfying experimentation with *set multiplot* (as used previously for QUARTER PLOT data), *with lines* and *with points* were added to the *plot* command for the first time. Very nice, this high-level plotting. Left over from the *multiplot* experimentation is specification of the data range within square brackets (first x, then y), which has the effect of ensuring that the curve passes through the upper-right corner of the bounding frame --- just as it passes through that corner of the grid of the Salford screen plot. If the user does not want this, manual removal using an editor is easy enough. The two ranges in question immediately follow the *plot* command.

Theory was documented by author Hevia's paper in the final issue of *EEUG News* last year. Included is section number 3 entitled *"Method of the flexible simplex."* The following paragraph, missing equations and figures, was created using excerpts of Mr. Hevia's writing:

*"Function minimization generally involves an iterative search for the optimum vector of independent variable values. There are many possible methods, and some of these require the calculation of partial derivatives of the function to be minimized. Others, using an ingenious adaptation to the environment, generally find an acceptable solution without having to calculate derivatives. One method that avoids derivatives was proposed by Nelder and Mead, and it is based on a so-called simplex. This name refers to a polyhedron defined in the space of n dimensions, where n is the number of independent variables. This polyhedron may or may not be regular. To find the minimum f(x), this function is calculated at each of the vertexes of the simplex, that is to say, for n+1 vectors of the independent variable x. Evaluating the function at each vertex, one notes which has the largest value. In Fig. 1, this vertex is represented by the letter A. The search for the minima then begins by means of a displacement of the maximum vertex through the center of the simplex, labeled with * in Fig. 1. A new simplex is thus formed, with all the remaining vertexes and the new vertex B. This process is called reflection. By iteration of this process, together with others named expansion, contraction and reduction …. the search progresses while avoiding local minima. …. One must check that the simplex always encloses a volume. Otherwise, an endless cycle (infinite loop) may result. … The iteration is monitored, and one can consider that a solution to the minimization problem has been obtained by one of the two following tests: First, if the correction to each one of the variables becomes arbitrarily small, which means that the simplex enclosing the solution has been reduced, practically, to a point. Second, if variation of the function is arbitrarily small over all vertexes of the polyhedron. For implementation in the ATP, the second possibility has been adopted. … The number of iterations may be high, but the process is extremely fast, and generally (at least for cases studied thus far) a solution is obtained before the fixed iteration limit has been reached."*

The need for engineering constraints is explained as follows by author Hevia: *"Solution of the minimization problem does not guarantee validity of ATP simulation using the non-linear inductor 93 type FORTRAN, however. This may surprise the reader, but it is true. Particularly, a negative coefficient C can be obtained, which means that for large currents the slope of the saturation curve is reversed. This is a physical impossibility for real ferromagnetic inductors. That is why the program prohibits a negative value for coefficient C by taking the absolute value of the result of the calculation. If instead a negative value had been prohibited during the iterative itself, the result would be zero, and this would not be consistent with reality, either. As current approaches infinity, note that a positive slope (the incremental inductance, which must necessarily be positive) is maintained only by positive C."*

The original modeling used the hyperbolic tangent TANH, which is good for many cases. But special cases are better treated by special medicine. Mr. Hevia has experimented with several smooth alternatives, including COSH (hyperbolic cosine), SINH (hyperbolic sine) and ** (exponentiation). Author Hevia explained that such extensions are simple enough for him: *"The preceding optimization was explained for a function of three parameters (A, B, and C). However, parameters are not limited in number, and the function need not involve tanh. Because derivatives are not involved, it is easy to apply the method to other saturation functions besides tanh. … Some of these functions, when applied to certain sets of saturation data, result in better approximations than would be possible using tanh. Incorporation of such alternative functions in the fitter is easy. But what about the associated ATP code to support use during simulation? This may be more complicated, but it, too, is manageable. The biggest problem seems to involve possible need for special restrictions on corrections during the Newton iteration at a given time step. In large measure, convergence difficulties depend on data, and size of the time step, so better protection can only be developed following extensive experience."*

News About TACS and MODELS

A new Type-68 TACS device is the inspiration of Robert Meredith of the New York City area. It is associated with Meredith's multiphase saturable transformer model that is explained in a separate story. For his data named AUT5, successful operation first was demonstrated on January 22nd. Speed for 6000 steps (to 100 msec) using Salford EMTP on your Editor's 133-MHz Pentium was reported in E-mail the following morning. Times for the time-step loop, in sec:

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Old model (supplemental variables):  72.802
New model (using Type-68 devices) :   9.011
```

Answers are the same except for roundoff error. The first line corresponds to data that relied on ordinary old TACS supplemental variables for much of the arithmetic. The second line shows how much faster (more than a factor of 8) execution is using the new Type-68 supplemental device to perform most of the arithmetic. Because the supplemental-variable logic of Laurent Dube is so inefficient (see stories entitled *"TACS Assembly language"* in this and the preceding issue), there is an enormous saving from the modularization of **any** substantial block of code. The $INCLUDE file for TACS data is much more compact, too: 71 lines for the new AUT5-TCK compared with 328 lines for the original AUT5-TAC. To conclude, the new Type-68 device is an enormous success for Mr. Meredith and his transformer model. For background about the math,

see *residual* (as in flux) in the January, 1996, newsletter. The present consideration seems to be an illustration of the sophisticated modeling of hysteresis and residual flux that Mr. Meredith was writing about more than two years ago.

Interpretation of input data cards was improved on February 17th for TACS supplemental devices. For more than two decades, the device number was the only way one such interpretation differed from another. Now, text explains meaning of the number involved. To illustrate using a Type-50 device, *"TACS supplemental device type 50"* was the old interpretation whereas *"TACS device type 50: Frequency sensor or meter"* is the new text for columns 1 through 50 (left of the card image).

Line and Cable Constants

The METRIC declaration of LINE CONSTANTS has for decades been the source of trouble with factor 1.609 (the number of kilometers in a mile). The 7th subcase of DC-59 represents one such attempt to document correct operation. Yet, operation is a function of outputs that have been specified by the user. Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina, observed that the 7th subcase, named DC59G.DAT for purposes of communication by E-mail, would have trouble with 1.609 if two changes were made: 1) the 44 were removed from cols. 67 and 68 (this is a request of output of the equivalent Pi); and 2) a 1-punch were added to column 69 (to request untransposed output). So, BPA's Dr. Tsu-huei Liu made a correction to LCMODE while working at home on December 24th. As your Editor observed to Mr. Hevia, she *"is a multitasking person. While watching things cook on her stove with one eye, she must be studying LINE CONSTANTS source code"* with the other. Continuing correct operation is documented by a new 8th subcase (the former 8th became the 9th).

Variable NGRND of CABLE PARAMETERS was not initialized for any first data subcase. Mr. Hevia discovered this shortcoming, and reported it to program developers in Portland around December 29th. As he explained, execution will die on the 2nd subcase of DC-27 if it is stored in a separate disk file. A correction was made January 2nd, after which replacement TPBIG was offered.

New Cascading of Line Sections

CASCADE LINE is a request for the series connection of line sections, transpositions, and miscellaneous lumped elements. It will enter the UTPF along with other changes to branch input as described in a separate story. Unlike other aspects of the overhaul of branch data input, CASCADE LINE involves new procedures and concepts of which the user should be aware.

CASCADED PI is the one old branch model that is not supported by the new code for branch input. Old DC-9 data will be rejected, if it is used with a new program. An error message (KILL = 58) will result. Yet, DC-9 as a name is not being abandoned. Rather, contents have been changed to illustrate various CASCADE LINE features. Anyone interested in use of the new modeling is referred to profuse comments that accompany the new illustrative data.

Why was CASCADED PI eliminated? Because it was too old: nearly 24 years. It was coded in 1974 (see page UICP-1 in Vol. IV *EMTP Memoranda* having date 29 November 1975) by BPA Trainee James Graffy to solve a problem that no longer exists. If someone needs to represent hundreds of cascaded line sections today, he simply connects them without difficulty. This was not possible 24 years ago, when memory was in much shorter supply and computers were much slower. Then, there was no hope of such representation in the time-step loop. But, phasor solution at one frequency **was** possible. Large volumes of data could be avoided by the creation of an equivalent [Y] among terminal nodes at the frequency of interest. This reveals yet another limitation that has made the CASCADED PI alternative unattractive during recent years: incompatibility with FREQUENCY SCAN or the new HARMONIC FREQUENCY SCAN. Finally, phasor solutions ignored nonlinear elements, and could not be used to determine transients associated with switching, or with non-sinusoidal excitation such as sources to represent lightning. Simulation was difficult during 1974.

CASCADE LINE provides no new modeling. Rather, it offers a new high-level data assembler that is convenient for cases involving numerous repetitions (including possible transpositions) of line sections. The concept is this. First, one line section is defined. A typical use would be to represent the transmission line between adjacent towers. Then, the user orders the cascade (series) connection of additional identical sections. Possible transposition is to be specified on an optional TRANSPOSITION request. The repetition of lumped elements followed by one line section is ordered by a REPETITION request. Although details have changed, this is comparable in concept to what was done using CASCADED PI. Typically the lumped elements will be associated with towers. Perhaps 15 years ago, Alvin Legate of BPA was studying a cascade connection of line segments that involved nonlinear resistors to ground at each tower. That sort of repetition (typically 4 or 5 per mile for many miles) is easily and compactly handled by the new CASCADE LINE feature.

Prof. G. Corwin Alexander of Oregon State University is credited with inspiring the modern reincarnation of line cascading. In E-mail dated November 20th, he wrote about educational needs. Included was a desire to assist Prof. Philip Magnusson with modification of an introductory undergraduate textbook on the subject. Free advertising: The book is *"Transmission Lines and Wave Propagation"* by Philip C. Magnusson, Gerald C. Alexander, and Vijai

K. Tripathi. The publisher is CRC Press of Boca Raton, Florida, and 1992 is the date of the Third Edition. Prof. Alexander wrote about the need to simulate *"lines made up of uniform sections"* and the *"use of terminating elements made up of linear resistance, inductance, capacitance or combinations of them."* With constant - parameter (sometimes even distortionless) line modeling, this is not a realistic simulation of industry. But it does represent a practical need of those trying to teach an understanding of concepts. This is the other practical case: lines that are artificially segmented in order to display waveforms as a function of position as well as time.

Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina, raised the question of cascaded line sections some two months later. He had mentioned work on *"a program to plot voltages as a function of the pole number in a line, for a constant time."* In response, your Editor had explained that the automatic cascading of line sections for simulation (as opposed to *phasor solution only*) seemed to be an idea whose time had come. After the basics of data specification have been perfected, one certainly can envision new and creative graphical displays such as the one mentioned by Mr. Hevia.

Any coupled line model can be used to represent the reference section. Whereas CASCADED PI required a nominal Pi-section, this is just one of the choices available to the CASCADE LINE user. More interesting and numerically efficient are distributed models. For simple cases, the constant-parameter modeling from K.C. Lee is an obvious choice. For cases requiring greater accuracy, SEMLYEN or JMARTI frequency dependence should be preferred. No problem, the new code allows one line segment of any type for which the user has data. Although a coupled line model is mentioned, this includes single-phase cases, which are important for educators. Rather than just *coupled*, it is more precise to say *coupled if two or more phases*. The first branch of the line must have type code -1 (distributed), 1 (Pi-circuit), or 51 (series R-L).

It is the uncoupled, lumped elements preceding a line section that have changed the most. For one thing, nonlinear elements now are allowed --- all except the Type-96 hysteresis model. In fact, any element (more than just nonlinear, this includes time-varying and pseudo-nonlinear) having type codes in excess of 90 (except 96) can be handled. Data requirements are simple because they are unchanged. Yet, there is an important restriction on the data of nonlinear elements: the reference branch procedure (names BUS3 and BUS4 of columns 15-26) must be used. This, in turn, implies that the first copy must be defined prior to the CASCADE LINE request that is to copy it.

Rules for naming internal nodes of the cascaded connection should be understood by any user since the user merely supplies sending-end and receiving-end names along with parameters representing the first line section. Sending-end names are not used during the cascading, so they remain arbitrary. But receiving-end names **are** used, and they must comply with several restrictions. First, they must be based on a single left-adjusted root name (e.g., JD as an abbreviation for BPA's famous 500-kV substation named John Day). This is to be followed by a letter to indicate the phase number: use A for the first conductor, B for the second (if multiphase), etc. Capital letters are assumed, so if the user does not key these himself, the program must be instructed to perform the conversion for the user (the result if KINSEN has value unity, recall). Finally, there must be adequate blank space on the right for decimal serialization of each interior connection point. All six bytes will be used, so if BUS1 for the first conductor might be JDA (in columns 3-5, followed by 3 blanks), JDB, JDC, etc. are expected to follow for all coupled phases. The first internal interconnection point then would be assigned node names JDA001, JDB001, etc. The second interconnection point, which follows the second line segment, would be assigned names JDA002, etc. Of course, the ordering of phases at the second or later interconnection point no longer is fixed; the user is able to modify it arbitrarily by a transposition.

Extra node names may be required at some (or each) interconnection point. The classical series connection of a capacitor (possibly thyristor-controlled, in our modern power-electronic world) provides a good illustration. In this case, the new name is created for the second end of the lumped element --- the end toward the receiving end. In order to avoid ambiguity, the letter of phase indication (A, B, ...) will be perturbed to lower case. For example, if the first end of a series capacitor had name JDA015, the second end will be given name JDa015. Be aware of the distinction, which is critical when it comes to requests for node voltage outputs or plotting (more about the latter in the next issue, perhaps).

Uncoupled shunt elements require the second of two perturbations to what otherwise would be uniform naming of internal nodes. Of course, if the lumped elements are connected directly from one conductor to ground, or directly from one conductor to another, there is no need for an extra node. But if an element connects one conductor to some dummy node (remember the -1, -2, ... use of old CASCADED PI data), there is need for another sort of internal name. A single decimal digital has been adopted for such use, and this allows as many as ten dummy nodes at each interconnection point. The user's numbers -1, -2, … -10 are indicated by digits 1, 2, ..., 9, and 0, respectively (note -10 becomes zero).

The effect of CASCADE LINE on List Sizes 1, 2, 3, and 9 is reported as part of interpretation that ends each such usage. This is believed to be important because of the hidden repetition. It is easy for the user to request the interconnection of too many line sections, and then wonder why the result was a KILL = 1 error message. Developers want the user to be aware of the burden that is associated with each CASCADE LINE use. Depending on how many digits are required for the display, more of less text will

accompany the numbers. There are three variations (so do not count on fixed text of this interpretation).

Variation of section length is not allowed as it was for the old CASCADED PI. It is worth explaining why. One line model (K.C. Lee) is easily varied in length whereas frequency-dependent models (JMARTI and SEMLYEN) can **not** be varied. In between, one has Pi-circuits and series R-L which can be varied with a little work. It seemed clearer and easier to insist on uniformity: no scaling of length for any model. If the user wants to change length, he is forced to end one CASCADE LINE use and begin another. This is easy enough, although it does force variation of the root name, which has both advantages (counting begins anew at unity) and disadvantages (lack of uniformity for the total cascade connection).

The TRANSPOSITION request was mentioned. This is new: separation of the transposition from the request for cascaded line sections. The use of an English word (as opposed to numbers) also is believed to represent progress. Although less compact, English-language requests are more self-explanatory. If the word TRANSPOSITION is not seen, there will be no transposition. As for the cascading of line sections, the request word REPETITION is used.

About output variables, branch requests of col. 80 should be honored within CASCADE LINE just as they are on the outside. Yet, there are differences due to the repetition. Each copy of the reference line section will have the same outputs as the reference section. The same goes for internal, lumped elements: if column 80 of one of them is zero or blank, there will be no output for either this first branch or any copy of it. Remembering that they will be repeated, column-80 punches within CASCADE LINE should be used only with extreme care.

Higher - Order Pi Circuits

HIGH ORDER PI CIRCUIT (HOPC) is a new, single-line request for a multi-phase Pi circuit. A single branch card is involved, and this makes reference to an external data file. Unlike $INCLUDE (which has provided comparable capability for many years), HOPC bypasses evaluation at the beginning of execution, and it also avoids the inefficiency of FORMATTED data (for those who are **really** serious). As order grows without obvious bound, these two considerations result in important differences in execution speed and storage requirements.

How high is high, and why? With Pentiums available nearly everywhere today, hundreds of coupled coils are practical. Typically this would be for the internal representation of a transformer by a manufacturer. The concept is old, as publicized more than two decades ago by G.E. transformer specialists Degeneff and White at 1977 PICA. Your Editor recalls talking to one of the authors in Toronto at the time. Yet, nothing ever was done with the idea until Dr. Hiroshi Arita of Hitachi Corporation in Hitachi, Japan., sent E-mail on February 18th expressing interest in such a program modification, which was made part of the overhaul of branch input (see separate story).

LIMCRD of STARTUP is the way the user bounds the size of his input data file. Recall not all operating systems or compilers are as capable as Salford or Watcom ATP, when it comes to tolerating large LIMCRD. Salford has no problem because virtual scratch files are allowed by its more sophisticated operating environment DBOS (which offers USE_VIRTUAL_SCRATCH FILES, as exploited by Robert Schultz during the Schultz Revolution). Watcom ATP has no problem because either Robert Meredith or Robert Schultz figured out how to grab the required storage dynamically (as needed), and provided this programming that is not really understood by developers in Portland. But DEC VMS was more seriously inconvenienced: someone controlling the operating system needed to grant more resources in the form of an expanded limit on virtual address space. So, DEC VMS ATP has a serious problem with high order data.

Even for program versions that can efficiently handle all of the data, gross inefficiency is involved. Consider an extreme case of 400 coupled coils. If full precision were used via $VINTAGE, 1, this would require one data card for each matrix cell. But 400 * 401 / 2 > 80K, and 80K card images requires 6.4 Mbytes to store. This is huge, even for an efficiently-paged system. Also, the logical and numerical burden of handling and then decoding 80K card images is substantial --- even if and when the RAM exists to hold it. It is much more efficient to bypass the card images and directly load program tables from an unformatted disk file. This is what is possible, using the new HOPC alternative. The next issue will summarize results for orders 100, 200, and 400.

C-like data is required for universality within the Intel family. There is similarity to what has been done for a decade or more with .PL4 files: use of C-like rather than UNFORMATTED allows portability from one program to another. For example, a Watcom UNFORMATTED .PL4 file will **not** be compatible with either Salford EMTP or TPPLOT, but a C-like file will be. Although not as universal as FORMATTED, C-like are more efficient numerically, and seem to be portable among choices for Intel PCs. Specifically, Watcom ATP, Salford EMTP, and GNU ATP all should be compatible. To ensure this advantage, C-like data rather than UNFORMATTED is required for the unformatted case. It should not be difficult to create. Either the Salford or the Watcom FORTRAN compiler could be used for data creation. Alternatively, any C compiler at all could be used, since the files are independent of the compiler.

A FORMATTED alternative is allowed, although this has been added mainly for test purposes. It avoids only part

of the card-image burden mentioned previously, and none of the burden of numerical decoding. For details of what must be done to switch from C-like to the FORMATTED alternative, see the illustration in DC3HIGH.DAT

Brain - Damaged MS Windows

Recall how a full-screen DOS window slowed the PS display of Meredith and Schultz (140 sec rather than 10 sec as explained in the preceding issue). Well, more than just a problem of MS NT seems to be involved. Masahiro Kan of Toshiba Corporation in Japan provided a report about the more widely used Windows 95. From his public E-mail dated December 8th: *"Tested PC: P200; Win95 (upgraded using Service Pack 1). Time for 14 plots: 10 seconds for DOS window. …very, very, and very slow for full-screen DOS window."*

For insight into what MS has done to HP-GL (see story in preceding issue), remember *Microsoft Gas (tm)* in the April, 1996, newsletter. Robert Hasibar updated this understanding as follows on December 2nd when he reported the following news release of unknown authorship: At a computer expo (COMDEX) Bill Gates reportedly compared the computer industry with the auto industry and stated *"If GM had kept up with technology like the computer industry has, we would all be driving twenty-five dollar cars that got 1000 mi/gal."* Recently General Motors addressed this comment by releasing the statement *"Yes, but would you want your car to crash twice a day?"*

Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina, is the most humorous critic of MS software. He seems to share your Editor's skepticism. In E-mail dated December 24th, he wrote: *"I am optimist, but BG and MS put doubts in my brain."* This was about the continuing MS trouble handling HP-GL (see story last time). As a non-user of both Win95 and WinNT, he has the right perspective about importance: *"'The Windows are to see the landscape, not to jump from the 95th"* floor.

CGM (Computer Graphic Metafile) format is an alternative to HP-GL for porting ATP or TPPLOT graphics into MS Word. This useful suggestion first was noted in E-mail from Orlando Hevia dated January 7th. Look for more about this in the next issue.

Corrections to This Newsletter

Corrections to this newsletter have been few and far between during the more than 10 years that it has been published, At issue are matters more important than isolated keying or grammatical mistakes.

Any reader who believes that anything of consequence has been published in error since issue number 1 in September of 1988 is invited to make his complaint to your Editor in writing. No such message has yet been received, but there is hope for lively content of this same story in future issues. Of course, like any newspaper editor, your Editor reserves the right to publish all or part of any comment from any reader. He also reserves the right to publish the final word, or not to publish at all.

Continuing DCG Misinformation

This is a continuation of a story having the same title in the preceding issue. It documents misinformation that was available from the DCG Web page on October 9th.

DCG myth #3 : *"BPA officially left DCG in 1990"* is a parenthetical comment at the end of a list of alleged North American members. There are two problems with the statement. First, as explained in detail in the March, 1988, paper, BPA did **not** leave DCG. Rather, DCG expired at the end of 1987, and BPA was a member the entire time. Second, 1990 is not even close to the end of BPA involvement with the misguided enterprise that was shared by EPRI. DCG writers seem like spin doctors of the Clinton-Gore White House --- unconcerned about the simplest of verifiable facts.

Question: what has happened to EPRI? In its ongoing war to commercialize EMTP, has it surrendered to DCG? The 1984 Memorandum of Understanding (MOU) between DCG and EPRI was one of equality in appearance. But most actual power (e.g., to price and sell EMTP to others) was held by EPRI. Yet, the DCG Web page now states: *"At present, North American members of DCG include … Electric Power Research Institute (EPRI) …. "* Could EPRI really be a DCG member? Alternatively, is this just one more piece of misinformation from the DCG gang?

Preview of coming attractions: Although not part of the DCG Web page, an even bigger misrepresentation about DCG and BPA will be reported next time. This has to do with the Type-59 S.M. of Dr. Vladimir Brandwajn.

GNU ATP for Linux and DOS

EGCS-1.00-Mingw32 seems to be an attractive alternative to the free DOS extender DJGPP that has been used to support ATP on Intel PCs than run WinNT. Like Watcom ATP, this avoids DOS completely. Masahiro Kan of Toshiba Corporation in Japan has been considering the possibility many months. Finally, on December 22nd, he reported success as follows in E-mail to Dr. Mumit Khan: *"Recently I looked at your home page, and found EGCS-1.00-Mingw32. It's great. You are doing nice work. …. I compiled again using EGCS-1.00-Mingw32 and succeeded to create a executable file for ATP (Alternative Transients Program). It worked fine. I have been using djgpp because the binaries compiled to work under Cygwin32 cannot be*

distributed without source code. This restriction could not be accepted in terms of ATP License. Now, ATP can work without the above restriction owing to your great work. We will be able to distribute ATP compiled by EGCS-1.00-Mingw32. Thanks so much for your work. ATP compiled by EGCS-1.00-Mingw32 has the following benefits over ATP compiled by djgpp: 1) long file name support; 2) quick starting; and 3) less real memory of PC is required."

PL4CONV is a new utility from Mr. Kan. Because GNU ATP itself did not create C-like .PL4 files, Mr. Kan decided to write his own utility to perform conversion to C-like. If executed by the same batch file RUNTP that executes ATP, this automates the creation process and would seem to obviate the need for C-like output of GNU ATP. Writing about PL4CONV in E-mail dated January 16th, Mr. Kan observed: *"This works under Win95/NT, although the version for DOS/Win3.1 is also available."*

BPA's Dr. Tsu-huei Liu tested a new GNU translation both before and after her trip to Japan during mid-March. Details might be reported next time.

Compiled TACS Speeds Simulation

This is a continuation of the story about compiled TACS in the preceding issue.

Stacked data subcases generally are **not** allowed. While verification of identical structure is rather crude today, the structure for such checking is in place, so it might be perfected later. For now, user caution is advised.

… A directory named \ATP was required for early releases, but this was incompatible with GNU for Linux, of course. So, in the absence of a more-sophisticated solution, the directory was removed. CTM output is local, and reference to it is local. If the user wants his FORTRAN elsewhere, he can move it as part of his batch file of CTM execution. This is what is done for Salford EMTP.

Longer FORTRAN lines were allowed following consideration of data for the new nonlinear, core-type transformer model by Robert Meredith of the New York City. Whereas conventional, real FORTRAN statements must be contained between columns 7 and 72, the TACS data statement begins in column 3 (following a 2-digit type code in columns 1-2) and might extend through column 80. To illustrate one of Mr. Meredith's long lines, the following extends through column 79, with only 3 blanks to the right of the equal sign in column 11:

```
C 3456789012345678901234567890123456789
99AUT5F1  =((AUT5E1.GT. 13.821)*(
 AUT5E1-13.821))**2*(AUT5E1.LT. 27.642)
```

For such lines that would extend beyond column 72, the line is split at the equal sign, with everything to the right being moved onto a continuation line. About Meredith's example, note the mixture of numeric and logical variables (another problem, which will not be treated here).

How fast is compiled TACS for that 60-variable test that was explained last time in the story about TACS assembly language (TAL)? There was insufficient space in the preceding issue. More than another set of similar numbers is required. The problem is with MATHMIN (the data that was supposed to represent negligible TACS). This data was adequate for a comparison of old TACS to TAL because TAL took a reasonable amount of time. But what about compiled TACS, otherwise known as *greased lightning*? It was found that compiled TACS simulation of all 60 variables (data file MATHCOMP was used for this) took not much longer than the one dummy TACS variable! The number was 9.407 seconds (again, average of the best 5 of 6 in a new DOS window of Win95 on your Editor's P133), which became .945 second after subtracting the MATHMIN time of 8.462 sec. Then a 3rd row could be added to the two in the preceding issue, giving:

```
Dube's original TACS,  60 variables :  97.75
New assembly language, 60 variables:    9.87
Compiled  TACS,        60 variables:     .94
```

Compiled TACS is **very** good, but not quite this good. It is not yet one hundred times old (Dube) TACS speed.

A **real** do-nothing TACS was created just to correct the preceding timing. At the top of the subroutine that is used to evaluate supplemental variables, GO TO 9800 was added to jump to the module exit. Then the MATHMIN average was timed to be 7.198 seconds, and the preceding table is modified to yield:

```
Dube's original TACS,  60 variables :  97.75
New assembly language, 60 variables:   11.13
Compiled  TACS,        60 variables:    2.21
```

Dividing row 1 by rows 2 and 3 then shows ratios:

```
Dube TACS / TACS assembly language  =   8.89
Dube TACS / compiled TACS           =  44.82
```

Finally, remember those 760 seconds for MODELS by Dube. This is the slowest. The ratio of slowest to fastest is:

```
Dube  MODELS / compiled TACS        = 336.31
```

So, almost a year and a half after the initial public report about slow MODELS simulation, we know much more. By using a big enough set of math, and a real do-nothing module, we finally have learned how slow MODELS code **really** is for basic arithmetic. That *"extremely poor programming technique"* that was observed by Meredith and Schultz (see JAN97.DOC) has consequences that are difficult to explain in terms of external (secondary) cache memory alone. Consider the ratio of MODELS to TAL :

```
Dube MODELS / TACS assembly language  =  63.74
```

Is cache memory 64 or more times faster than ordinary RAM? If not, poor programming itself provides a more plausible explanation of the huge discrepancy.

TACS Assembly Language

TACS ASSEMBLY LANGUAGE (TAL) is a new special-request word that refers to use of lower-level

(assembly-language-like) coding for TACS supplemental variables.

Speed of Laurent Dube's original TACS, which dates to 1975, is significantly greater for pocket-calculator-type mathematics than speed of the free-format alternative that he installed during the spring of 1980. Consider the same mathematics as were timed one year ago, but using 100K steps between zero and 2 seconds rather than 10K. This eliminates the need for multiple trials. It also minimizes output (beginning at step 10K, print every 10K-th step only). Answers are identical, whether using the 1980 data of one year ago or the following 1975 equivalent (for simplicity, just the start and the end are shown):

```
  90123456789012345678901234567890123456789012345678
    --PRX----> <fun><name> <fun><name> <fun><valu>
99DUMC :  1.0 +     TIMEX
99TEST1: 10.0 *     DUMC  *     DUMC  +       50.
99DUMF :2500. *     TEST6 *     TEST6
99DUMG :            TEST2 *     TEST2
99DUMH :            DUMG  +     DUMF
99TWO? :2.E-4 *     DUMH
```

This may not be optimally coded, but it is good enough to demonstrate significant improvement from what is done today. The following are times spent in the time-step loop for DISK execution of Salford EMTP under Win95 DOS (not a DOS window of Win95) on your Editor's 133-MHz Pentium:

```
      1980 data of MATHTAC1.DAT :    18.077
      1975 data of MATHOLD.DAT  :    13.077
```

This shows that one can increase speed by 38% just by turning the clock back five years. A difference of more than a third is big enough to *feel*. It is surprising that no user complained about the loss of speed at the time.

Protection Against Unix, Tab, Etc.

UNIXON is a new switch of STARTUP that allows the use of Unix data files with Salford EMTP (and any other MS DOS/Windows version of ATP that might support this new option). Recall Unix uses just **<LF>** to terminate each line of an edit file. This differs from MS-DOS, which terminates each line with **<CR><LF>** (0D and 0A in hexadecimal as used by Vernon Buerg's freeware LIST following **Alt-H**, which are 13 and 10 in decimal). Prior to addition of the new code on January 11th, Unix data files were treated badly by Salford EMTP, which limited input from any one file to a single line.

A data file from Robert Meredith of the New York City area was responsible for your Editor's decision to provide optional protection against Unix files. Involved was data associated with Mr. Meredith's creative new transformer model, which should be mentioned elsewhere in this issue. Had the lack of DOS termination first been noticed in the main data file, probably the cause of the trouble would have been discovered quickly enough. This was not the case, however, because your Editor had modified the main faile using DOS EDIT, and this converted that one file from Unix to DOS. The first trouble occurred within one of the several $INCLUDE files. Only after a couple of hours of experimentation did the source of the problem dawn on your Editor. The education was traumatic enough to inspire new protection, which is ordered by toggling the binary switch UNIXON from zero (as distributed by the user group) to unity.

Use of the new Unix protection is not recommended for every DOS/Windows user. It carries an associated price. An extra handling of all data is involved. The data first is read as a C-like .PL4 file would be, using Salford DBOS READF@ after connection by OPENRW@. Not only does this require extra time, it also requires extra virtual memory. Although the code is compact, unless and/or until it might be recoded with more sophistication, the memory required for data will equal the size of the user's largest disk file. Also, upon completion, contents of the last disk file handled will be left in disk file dumbunix.lis (located wherever the program is). The spelling is intentional; it reflects your Editor's opinion of the line-ending difference between DOS and Unix files.

All standard test cases DC*.DAT were made usable with Unix protection. Two disk files were not usable prior to numerous corrections, however. The most frequent trouble was traced to those famous **Tab** characters, which have numeric value 9. Previous removals of these seem to have been confined to data that passed through the normal ATP input routine CIMAGE. Data for MODELS by Laurent Dube does its own input, and such data accounted for most problems. The new Unix protection rejects any character having a code less than ten. Execution will stop on any such byte, and the screen will show either the preceding line (if more than 10 bytes) or the preceding 40 bytes. It also will show a line number, and byte numbers of the line within the file. All of this should allow the user to pinpoint the location easily enough. But if more output is desired, use STARTUP to initialize IPRSUP to value 10 or more. This will result in the output of every line that is handled. Many occurrences of **Tab** were extracted from the 7th subcase of DC-68 using this tool. After each halt, the DOS editor was used on the offending, indented lines. First, the **Del** key was used to remove all blanks on the left, and then the blanks were restored using the space bar. It was simple enough, using the Win95 editor.

Readers are reminded that freeware FC by Mike Albert, (distributed on the GIVE2 disk of Salford EMTP) will not show line differences due to **Tab** characters. But it does seem to report file sizes correctly. For DC-68, the comparison of old with new ends as follows:

```
      dc68.dat      31829   5-23-96   3:22a
      a:dc68.dat    32053   1-11-98  12:54p
      Lines in files are identical
```

The Greek letter omega, which appeared 4 times on comment cards that document the frequency dependence of Prof. Mustafa Kizilcay, caused trouble when DC-23 was protected against Unix. Curiously, the associated character code was found to be negative (-22). How is this possible?

What does it mean? In any case, simple editing erased the Greek letter (in its place, the English *ohm* was keyed).

Watcom ATP seems to have no need for the UNIXON flag. According to E-mail from Robert Meredith dated January 9th, *"I'm a bit surprised you had trouble with them, because I ran the case under Watcom ATP before I sent them to you."* Well, not as surprised as your Editor!

While on the subject of Watcom, parameter KTRPL4 of STARTUP had trouble in the absence of an appended minus sign. This was reported by Masahiro Kan of Toshiba Corporation in Japan, as already explained in the lead story. One day after the correction of Salford EMTP, Watcom ATP was corrected the same way.

Branch Data Input Restructured

Spaghetti code is the derogatory term that could be applied to the branch input logic as it has evolved during the past three decades. This began with Prof. Dommel at a time when such coding was necessary to save precious memory. The technique was greatly expanded after he left in 1973 --- first to accommodate various new models, and later to humor the crummy Sun compiler (which was unable to cope with large subroutines at the same time it tried to optimize) which BPA used during the late '80s and early '90s. The resulting branch code was both reliable and generally efficient, but difficult to modify and maintain. So, as an outgrowth of the coding for non-symmetric [R] and [L] (see October story), branch input has been overhauled completely during several months that began last year.

Another favorable result of the new branch input is possible saving of memory. List 21 now is smaller for repeated, transposed, constant-parameter, distributed lines having other than 3 phases. Before, 3-phase use was noted, and it exploited the reference branch concept (only one copy of internally-generated [T] was stored in List 21). But now any number of phases not exceeding 18 is remembered for the 2nd or later usage. Included is the important special-double-circuit model having zero-sequence coupling between the two 3-phase circuits. This is probably the most common practical case other than 3-phase. This progress was made January 7th and 8th.

The Semlyen lumped-element recursive convolution model no longer is supported by ATP. Perhaps it never was (readers should not be alarmed that anything of value is being withdrawn). Section IV-D-4 of the Rule Book defines variable N5 of columns 75-78 as being the number of coupled modes of a distributed line. Yet, Dr. Liu noted code to support a zero value for the 2nd or later phase. Not understanding any possible use, the workers decided to remove this code, which dates to Robert Eifrig and the summer of 1976. Most likely it was part of lumped-element modeling that had been removed a decade or more ago. With no such data known to be in use, there is no reason for associated code to continue to exist, so it was removed January 9th. Remember, ATP has its own frequency-dependent, lumped-element modeling: Kizilcay frequency dependence as illustrated in DC-23.

The old CASCADED PI has been replaced by new CASCADE LINE as explained in a separate story. Much more than restructuring of data input is involved.

Hoidalen Improves ATPDRAW

"Hans Kristian Hoidalen has provided a great update of the Win95/NT version of ATPDraw. There are lots of links to related information, details of features and use, etc. You can see it at : http://www.ee.mtu.edu/atp/atpdraw/ATPDraw.html" This announcement by Prof. Bruce Mork of Michigan Tech appeared in E-mail of his Fargo list server dated February 18th. It was an unexpected supplement to the expected announcement of availability of the January newsletter.

Tamir Orbach of Kim Development was mentioned in the January and July newsletters of last year (1997). First, your Editor asked if anyone knew whether Mr. Orbach's commercial initiative (alleged competition for Hoidalen's ATPDRAW) had fulfilled on schedule its promises of future development. He also asked about sales. That was in January of 1997. Six months later, after receiving no response, and after Hoidalen's release of ATPDRAW versions for MS Windows, your Editor asked whether anyone continued to care about Orbach's work. For the record, there has been no response to this July inquiry, either. If Tamir Orbach's attempt to compete with Hoidalen remains alive, it would seem to be a well-kept secret among ATP users. Might Orbach's initiative remain alive while isolated from the community of ATP users? It is possible that users of DCG/EPRI EMTP might be targeted, following failure with the much larger group of ATP users. Recall that Mr. Orbach promised substantial future development, and part of this might have been tailored to ATP. But your Editor saw little if any indication in initial advertising that ATP features then were being supported. It appeared to your Editor that Mr. Orbach had a program to assemble primitive EMTP data. In fact, it might be better suited for DCG/EPRI EMTP data than for ATP data since the former seemed to be less changed from that used by BPA's M39. version of EMTP dating to July of 1984. On the other hand, how stupid are DCG / EPRI EMTP developers? Your Editor repeats his call of last July: does anyone know if Orbach still is working on, or marketing, his EMTP data-assembly program?

Publishing Programs and Viewers

Corel WordPerfect 8 for $36? This great price was reported by Robert Schultz of the New York City area. In

E-mail dated December 8th, he wrote: *"Bob M. and I are still interested in converting ATP documentation to PDF format. When I was at the local computer show on Saturday, I purchased the complete Corel WordPerfect Suite 8 for $36. This ostensibly gives the ability to manipulate older (WP7 and earlier) WP documents. Could you please send me the material in WP format which Bob M. was trying to convert from your PS format? I might have better luck in doing the Postscript conversion."* Of course, more than luck is involved. Mr. Schultz sensed that Robert Meredith's trouble with our PostScript (PS) was related to the environment of our creation. Although the present issue is full, more information might be provided next time.

Frequency Scans and Harmonics

HARMONIC FREQUENCY SCAN (HFS) is a new request word inspired by Gabor Furst of suburban Vancouver, British Columbia, Canada. The preceding issue indicated that Mr. Furst had creative ideas about how ATP might better be used for harmonic analysis. The initial batch of modifications, which included a Fourier bar chart for output, entered the UTPF on January 2nd.

HFS involves a modification of the old, conventional FREQUENCY SCAN (FS), which has been available for two decades or so. The old FS incremented frequency regularly -- either arithmetically or geometrically. This is one difference: HFS will produce a phasor solution for whatever frequencies the user wants. But a bigger difference is this: rather than keep source amplitudes fixed, the program varies source amplitudes with frequency according to user desires. Each source can involve whatever magnitudes, angles, and frequencies the user desires. For each distinct frequency, there will be a separate phasor solution involving just the sources with excitation at that frequency.

Power frequency excitation must be defined for each and every source. But any higher harmonic of any source can be missing. If not defined by the user, the amplitude will be assumed to be zero. Remember what a zero amplitude means: either a short circuit (if a voltage source) or an open circuit (if a current source). If no source exists for some harmonic, that phasor solution will be skipped. There will be no such output vector in either the .LIS file or the .PL4 file. But in any Fourier bar chart (see later paragraph), such a missing harmonic will be represented by its harmonic number alone (the vertical bar above it will be missing).

The .LIS file will include interpretation of all source cards for the power frequency. This will be the usual, familiar interpretation of source cards that precedes the connectivity display. As for source cards of higher harmonics, interpretation for these will be seen in the .LIS file only if the user has made KSSOUT positive (a request for phasor branch flows and/or generator injections).

The lowest frequency on Type-14 source cards is allowed to have only two possible values. If equal to the power frequency STATFR (as read from STARTUP and possibly redefined by a POWER FREQUENCY request), ATP assumes the frequency field of all source cards to be in Hz. Alternatively, if the minimum frequency is equal to unity, the frequency field of all source cards is assumed to be a harmonic number (i.e., an integer multiple of the power frequency). Yet, this is just for purposes of data input. Internally, frequency in Hz always is used, and always will label each output vector of the .LIS file. Finally, harmonic number always is used for a Fourier bar chart (next paragraph).

A Fourier bar chart will be produced by any batch-mode, vector plot request of a HFS data case. Of course, there is not actually any Fourier series computation. Thanks to FS, the output signals themselves already contain this harmonic decomposition (sort of). So, code for the Fourier display simply is borrowed after frequencies in Hz are converted to harmonic numbers based on the power (fundamental) frequency. Salford EMTP will produce a nice-looking screen plot, although this may be missing from other versions (e.g., Watcom or GNU). All versions should produce HP-GL output that is compatible with Corel WP 7 or MS Word 6 or 7 (see separate mention of Fourier bar chart). The fourier plot always begins with harmonic 1 on the left, whether or not this was in the frequency range requested by the plot card. The maximum frequency will correspond to the last one picked up by the user, however. In between, any harmonic that was skipped will show up as an empty space with the appropriate number below it.

Positive LUNIT4 is required for HFS until a conflict of memory might be resolved. This was discovered December 31st, and for a while the beta testers were advised to use $DEPOSIT on LUNIT4 within their data. But no later than February 21st, the constraint was applied internally. Regardless of what the user declares in STARTUP or by $DEPOSIT or any other declaration, ATP will make LUNIT4 internally as the input of branch cards is about to begin.

Switch currents were added as possible outputs of either FS or HFS to satisfy a request from Gene Porter in Knoxville, Tennessee. On February 27th, he had written: *"The study is progressing well. I have added 24 capacitors and loads to the model. ATP HFS and SuperHarm are in agreement with each other. There is some phase shift at higher frequencies but that is due to my modeling. Keep in mind that I have not used ATP for awhile, how in the world do you get branch currents? .... I would like to take a look at the current amplification factor with shunt capacitors in service. I also need to evaluate IEEE 519 current limits. Please help me out here since it's been past my 30 minute rule."*

On to an explanation of Gene Porter, since this is a new name to newsletters (if not the industry). A clue is provided

by location: until recently becoming self-employed under the name of Power Profiles, Inc., Mr. Porter was an employee of Electrotek Concepts., where he did **not** have access to ATP. So, he is a new ATP user. Mr. Porter seems to have been the most useful guinea pig for Gabor Furst because Mr. Porter previously was in the business using different tools (e.g., that SuperHarm). It is what Mr. Porter did **not** find about ATP that was most valuable. I.e., he is a professional of harmonic studies who was able to provide independent confirmation of Gabor Furst's judgments. His early objection to the lack of branch-current output was appreciated. This was a case where Mr. Porter made the suggestion first, and Mr. Furst then agreed.

All-new output variables for both FS and HFS were the result of the preceding determination. Switch currents were just the beginning. Mr. Porter observed that he should not need to tear his already-tested network apart (to insert switches) in order to monitor current. Your Editor agreed, and that was the basis of the overhaul that began as Dr. Liu was preparing to leave for Japan (see separate story). The principle is this: the output of FS and HFS is to be similar to the output of the time-step loop. Of course, time in seconds is replaced by frequency in Hertz. But bigger changes occur for the remaining variables. Node voltages, branch voltages, and branch currents all will be available, and in their natural positions, identified by their natural names. Details next time. The HFS story is too big for one issue, anyway, and this detail is easily delayed.

More convenient load presentation was another aspect of the Furst-inspired reforms. Coding was done for HFS use. Yet, use is not restricted to HFS, so details are summarized elsewhere in this issue. Initially (beginning January 3rd), only the CIGRE recommendation of constant L in parallel with series R-L is provided -- either for single phase or for 3-phase use. Upon learning of this, Stu Cook of Just Services suggested his own preferred alternative (see separate story about <JUST> use).

About limits of HFS, existing Salford TPBIG list sizes are being used in new ways. The number of distinct (different) frequencies of the scan is limited to 3002 (List 1), the number of distinct (different) source busses is limited by 1360 (4 times List 4), and the total number of source cards is limited to 40K (List 23). It seems unlikely that any realistic use will test these limits in the near future (famous last words).

New 4th .PL4 File Type via widexx

This is a continuation of the story in the preceding issue about TPPLOT RELAY-like .PL4 output of ATP.…

Negative LUNIT4 was required prior to December 18th --- two days after Harald Wehrend of SEG in Kempen, Germany, reported a Watcom error using a positive value and batch-mode plot cards. The correction tolerates batch-mode plotting of the same simulation, but not such plotting of a subsequent REPLOT connection. If any user needs REPLOT or other delayed support, explain why.

NEWPL4 is an old parameter of STARTUP (see the April, 1995, newsletter) that was ignored for widexx use prior to December 23rd when it was empowered to eliminate the three heading lines (if value is unity). This extended to ATP the flexibility that had been added to the EXPORT command of TPPLOT as explained in the July, 1995, newsletter. Harald Wehrend of SEG in Kempen, Germany, explained the need as follows: *"From what I read, … the newest MathCad version 7 ignores lines until it finds a fully-numeric line. But for other programs such as Excel, this can be very useful."*

FREQUENCY SCAN or HARMONIC FREQUENCY SCAN did not support widexx prior to the addition of more code on January 18th. Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina, was the first to complain of the lack; this was in E-mail two days earlier.

Power Company Politics & Religion

"BPA chief questions altering federal dams" is the headline at the top of page D1 of *The Oregonian* dated December 17th. Finally, following the departure of Randy Hardy and his politically-correct friends, some sanity has returned to public expressions of BPA policy. *"Altering federal dams to aid salmon would pollute the Northwest's air, hurt its ability to produce emergency electric power and undermine protections from devastating floods, the acting head of the Bonneville Power Administration said Tuesday. Jack Robertson's statements represent the first clear public stance by the federal agency on the subject of dam removal in the Columbia River Basin."* Of course, that reference to emergency power brings to mind the great Randy Hardy blackout (see mention of *The Dalles* in the October, 1996, newsletter). As for pollution, this is obvious: the burning of fossil fuels (the only practical alternative, now that the American nuclear industry has been effectively destroyed by environmental alarmists) adversely impacts the air. It also is **much** more expensive (the dams already have been built).

A sewer outage complemented two extended (hours-long) electric power outages to end the nine memorable months at Skyport. Documentation of the trouble with water can be found in emergency E-mail from Nancy Heilman on January 6th. After *"Subject: IMPORTANT:,"* she wrote: *"HAVING SEWER PUMP PROBLEM. Don't use toilets or use water of any kind until we hear it is fixed."* No doubt about it, where we were located --- down there in the middle of that damn swamp (affectionately referred to as a *wetland* by environmentalists), at river level --- the pump was a critical component of the system. Gravity would **not** do the job! Oh well, at least parking was free and easy (this will be remembered fondly by some)! Appendage March 18th: the huge *for lease* sign is still in

front of the building. One of the reasons management gave for vacating early was the possibility that money could be saved by subleasing the building. Six weeks later, it looks as though management was wrong again.

Yet, Dittmer, the final resting place for System Planning, was worse. Employees are being packed like sardines, and this seems to overload the air conditioning system (in the middle of the winter, no less!). Lighting and acoustics are bad, according to one formal complaint that was made to management. Having participated in opening day, your Editor was inspired to consider alternatives. As this paragraph is being keyed two and a half weeks later, he can report that he has not returned. He tried to walk his way in once, but failed during a 5-hour attempt that included about 1.5 hours riding or waiting for busses. So, all ATP work is being done at home, and it is communicated with others via E-mail. Your Editor walks to BPA's main building where an unused, borrowed computer allows connection to Dr. Liu's E-mail (that remote post office finally showed a clear benefit). As the public was warned via Fargo on February 9th, Agora no longer is being used. Remember address **thliu@bpa.gov** for communication with your Editor.

Since the sale of BPA might not be feasible (because of its negative net worth), might BPA and its associated problems (e.g., failed salmon recovery) be **given** away? I.e., might BPA be transferred to the states it serves? This creative idea seems to have occurred to the Clinton administration. *"Northwest states could gain control of BPA"* is the title of a story on page D1 of *The Oregonian* dated December 13th. *"The new plan is different. Under this scenario, the federal government would give Oregon, Washington, Idaho and Montana control of the agency and its responsibilities, an administration source said Friday."* Needless to say, federal politicians from the region seem to be opposed to any such proposed reduction in their sphere of influence: *"Northwest senators, who have held sway over the BPA, this week attacked the notion that the government might give up control of it."* As for the Clinton Administration, having enough other problems of its own, it would seem to want to rid itself of the BPA problem.

Meanwhile, BPA **still** does not have a permanent administrator. Why? It seems various politicians who have influence can not agree; and the Clinton-Gore White House, having troubles enough of its own, refuses to exercise leadership by naming a candidate. Selection obviously has more to do with politics than merit, and BPA's many problems probably represent a strong disincentive to any really good candidate as well as to the politicians who would be needed to support him. So, still no progress during mid-April as this story is closed.

Load models <LOAD> and <LOAD3

CIGRE harmonic load modeling was recommended by Gabor Furst for his HARMONIC FREQUENCY SCAN (HFS) studies. Yet, they are not a part of that story because HFS is not required for their use. The concept is simple: model a load using a lossless inductor connected to ground in parallel with a lossy inductor (the latter being a series R-L branch). In terms of constants A, B, and C, and power-frequency voltage magnitude V, real power P, and reactive power Q, parameters of the two branches are determined using three formulas as follows: 1) Rs = V**2/P ; 2) Xs = A * h * Rs ; and 3) Xp = h * Rs / [(B * Q / P) - C] . The CIGRE-recommended constants A = .073, B =6.7, and C = 0.74 have been built into the program as default values. If different values are wanted, they can be defined in data using a "CIGRE A,B,C" declaration as illustrated in the new 5th and 6th subcases of DCNEW-21, which was created January 3rd.

DCNEW-21 illustrates one single-phase and one 3-phase load as requested by A6 **<LOAD>** and **<LOAD3**, respectively. To avoid confusion between nodes and loads, do not use either of these 6-character names as a node name. With the introduction of CIGRE harmonic load modeling, these names become reserved for internal use, so are unavailable to the user. More may follow, using different request words. In a telephone conversation on January 2nd, Stu Cook expressed interest in another formula.

<JUST> and **<JUST3** are reserved names for BUS2 just as **<LOAD>** and **<LOAD3** are. The concept is the same, but details differ. The new names can be traced to JUST Services, which is the name of Stu Cook's company in suburban Montreal, Quebec, Canada. In E-mail dated January 19th, he clearly pointed out that the loads he uses for harmonic studies have a series connection. Whereas Gabor Furst puts Lp in parallel with the series connection of Rs and Ls, Stu Cook puts an inductor in series with the parallel connection of a second inductor and a resistor. Mr. Cook concluded with an explanation that *"there is an element of art to this; it isn't precise science."* Yes, and **<JUST>** is being provided in recognition of the fact that different persons appreciate different art. The request is honored beginning January 23rd even though it does not yet connect to any special formulas. Rather, the resistance and two inductance values are read directly from the branch card that bears the **<JUST>** or **<JUST3** request.

Frequency - dependent Series R-L-C

NEXT FREQUENCY FOR SERIES RLC is the request that introduces data to describe the frequency dependence of one or more series R-L-C branches during execution of HARMONIC FREQUENCY SCAN (HFS). Each such request is to be followed by high-frequency data for series R-L-C branches --- the second of two points for each such branch. The first is the preceding, normal branch data, which is assumed to apply to the power frequency. With two points for each parameter, ATP can interpolate or extrapolate linearly to estimate a parameter value for any frequency of the scan.

A blank card terminates the last high-frequency data card just mentioned. This is a new requirement for HFS data cases, whether or not there are any frequency-dependent series R-L-C branches. For a case without any, the new blank card separates the blank card ending sources from the following data for node-voltage output. Such usage began January 29th.

Subcases numbered 5-8 within DCNEW-21 illustrate the new frequency dependence for series R-L-C elements. As explained on comment cards, most uses are simple enough to be confirmed by inspection. Where this is not the case, the correct answer is confirmed by separate, non-HFS solution (see subcases 9 and 10). The use of 2 or more higher frequencies is not illustrated, but it is implied by the first word of the request (next). There is no limit on the number of higher frequencies, which can be changed as often as the user desires. Such frequencies simply are taken one at a time until the blank card terminates such data.

Ordinary old FREQUENCY SCAN (FS) does not yet support the new frequency dependence of series R-L-C elements. It could, but it does not yet. The extension has been delayed because of concern about making old data incompatible (that extra blank card that is required). If FS users want the new frequency dependence, they had better begin lobbying for a consensus to produce such change.

Miscellaneous Intel PC Information

Illegal computer chip remarking is a big problem for Intel. The idea is simple: a higher-speed microprocessor is worth hundreds of dollars more than a slower ones, so enterprising criminals have learned that they are able to modify Intel product marking and sell the chips for more money. This seems to be a big business in Southern California. The dominant story on page B1 of *The Oregonian* dated December 5th began as follows: *"Police raided a ring of illegal computer chip remarking shops around Los Angeles that might have turned out some counterfeit Pentium processors surfacing in computer shops in Portland. Los Angeles County sheriff's deputies said Thursday that they had raided seven businesses and three homes Wednesday. .... Deputies seized 2,400 remarked Intel Pentium chips, remarking equipment and 2,000 counterfeit Microsoft mice. ...."* The problem for consumers is higher rates of failure: *"remarked chips in general have a higher percentage of breakdown. They also often can be contaminated in the garage-like shops where people tinker on them."*

Celeron is the name of a new Intel microprocessor. At the time of Pentium Pro, and then Pentium II, this writer offered the opinion that the revolution seemed to have slowed. Celeron should be a sign no one can miss. Of course, Intel would love to continue its upward spiral of complexity and cost, but who needs it? More precisely, how many consumers are willing to pay for it? Not the buyers of Celeron. *"Intel christens cheaper chip to target lower-cost PCs"* is the title of a story on page E1 of the March 5th issue of *The Oregonian*. The low end represents a big and growing market: *"Today, nearly one out of every two PCs sold costs less than $1,000."* Why pay more?

"Compaq plans to buy Digital" is the headline of an AP story that appears on page B1 of *The Oregonian* dated January 27th. This would seem to signal a bizarre end to what once was the number 2 computer maker in America. While Apple struggles to maintain itself as a company, DEC has capitulated. Recall the mention of CEO Robert Palmer in the July, 1994, newsletter. Four years ago, he had warned DEC employees that *"failure to act promptly will result in greater loss of employment. In fact, the entire enterprise could be at risk."* The entire enterprise was at risk in spite of the job cuts, of course. How many who survived the intervening four years will be allowed to keep their jobs? *"The companies will disclose details of any layoffs when the deal is completed in three to four months"* according to *"Compaq chief executive Eckhard Pfeiffer."* Maryfran Johnson, said to be an executive editor of *ComputerWorld* magazine, is quoted as follows: *"When we look back on Bob Palmer's legacy, it's going to be the dismantling of Digital. He's essentially sold the company off in bits and pieces."*

"Apple will abandon further work on Newton hand-held computer" is the title of a short story on page E1 of *The Oregonian* dated February 28th. *"The move ends persistent speculation that Apple would try to sell the Newton division. Last year, Apple said it would spin off Newton into an autonomous subsidiary, then reversed that decision."* At least Palmer was able to sell the pieces of DEC. It appears time is running out on Apple, which did not sell when it might have. One week later, Mike Francis explained that the Newton concept dated to 1987, when then-CEO Sculley introduced the idea of a *"personal digital assistant."* But early offerings disappointed. More recently, Apple has been badly beaten in the market place. In a story on page E1 of the March 6th issue: *"The Wall Street Journal reported that about 200,000 had been sold since they were introduced in 1993, a figure that compares poorly with the 1 million U.S. Robotics Palm Pilot devices sold in the past two years."*

Miscellaneous Small Items

ALLOW EVEN PLOT FREQUENCY (AEPF) is a new request that was inspired by Prof. Mustafa Kizilcay of FH Osnabrueck in Germany. In E-mail dated February 19th, the EEUG Chairman explained that this would allow exactly one period in the .PL4 file for IPLOT greater than unity. He wrote: "Of course, IPLOT=1 satisfies this condition. Manufacturers of protective relays may prefer IPLOT=2 or 4, however." So, the 30-year-old logic of Prof. Dommel

finally can be circumvented, although it requires a specific, explicit request. In the absence of an AEPF request, even IPLOT in columns 9-16 of the integer miscellaneous data card will continue to be made odd by the addition of one; and a new warning message will note the modification. But with an AEPF request, such improvement will be ignored. For an illustration of AEPF use, see Gabor Furst's SVC data case in DC-22. Prior to February 20th, IPLOT had value 3. With this changed to 4, small changes to the PRINTER PLOT occurred. That was the only effect.

Prof. Willis Long of the University of Wisconsin in Madison has been credited with assisting a European ATP user! This unlikely news was found in E-mail from the EEUG Chairman, Prof. Mustafa Kizilcay of FH Osnabrueck in Germany. Dated November 18th, the message documented confusion of a relatively new user in Moscow, Russia --- a user who had approached Prof. Long for assistance. Why is unknown. Certainly the record showed plenty of response from both Osnabrueck and Budapest (Laszlo Prikler). Prof. Kizilcay concluded: *"Apparently, Dr. xxxxxxxx has not known the difference between the world-wide mostly used noncommercial, royality-free ATP-EMTP and the commercial version of DCG/EPRI EMTP. So, Dr. Khoudiakov has contacted Prof. Long, too. I thank Prof. Long for his effort to help Dr. xxxxxxxx in ATP-EMTP matters."* As usual, the real name has been changed to protect the individual, who probably already has been embarrassed enough privately. Nothing more than an honest mistake seems to have been involved, and Prof. Long seems to have behaved honorably in the matter. Maybe he no longer is working for DCG or EPRI (recall the March, 1988, issue of LEC's *EMTP News* documents much less-satisfactory and much less-honest performance as Editor of DCG/EPRI's *EMTP Review*) ?

HP-GL output of a Fourier bar chart was added as explained in the first story, which mentioned hollow rectangles. Well, they were not hollow for long, thanks to the insight of Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina. Attached to E-mail dated December 23rd, he sent HP-GL and MS Word .DOC examples of shading. He wrote: *"The filter obeys the PW (pen width command) PW w,n …. But the filter does not obey the LA (line attribute) command."* The real problem is with MS Word, not with HP-GL, note. HP-GL as a language has plenty of power. The problem is, Bill G's input filter only recognizes certain basic parts of this. As a result, ATP HP-GL output has been deliberately simplified so as to be compatible with the filter that accompanied MS Word 7 for your Editor's Win95 computer (acquired from Szymanski early in 1996).

PSCTYP of STARTUP is used to provide the file type for PostScript output of batch-mode plotting (assuming NOPOST is not unity). Prior to reform on December 4th, the default was .PS (note upper case). This was changed to lower case (.ps) in order to be consistent with many other choices in the program. For case-insensitive systems such as DOS, the change is inconsequential. But for Unix and other case-sensitive operating systems, this will make the entire file name lower case (assuming the user keys a lower-case name as is common practice).

Prof. Saul Goldberg of Cal Poly in San Luis Obispo, California, has been heard from once again after years of isolation from the ATP world. Recall that the first ATP short course to use only PCs (one per student) was the innovation of Profs. Goldberg and Horton during the summer of 1988. Well, on November 17th, writing from address **sgoldber@gauss.ee.calpoly.edu**, Prof. Goldberg explained: *"I haven't been in contact with you for some time now. I was Chairman of the EE Department for 3-years and then on sabbatical for a year and am now getting back to teaching, research and consulting (maybe)."*

DC-21 involves a Type-50 TACS frequency sensor named DEV50I which sometimes issued a warning message about rejection of the new estimate on step number 10. On January 12th, for no good reason, this message disappeared. Otherwise, the solution was unchanged. Upon investigation, it was discovered that roundoff was involved because the frequency computation occurred at the same time as the beginning of TACS warning messages (TIMTAC = 1.0). By reducing TIMTAC to 0.99 as detailed on comment cards, all computers and all compilers and all hardware should display the warning message. Previously, this was not true.

Simultaneous batch-mode plotting and .PL4-file creation sometimes was not possible if plot points were being cached in RAM. For Salford or Watcom ATP, such use is common (see DC-32 or DC-46) because the .PL4 files are C-like, and there is special code to support it. But what about use with other .PL4 file types? The need is even greater for GNU ATP, which does not yet allow C-like creation of a .PL4 file. So, in response to a restatement of the long-known shortcoming on January 13th (Masahiro Kan's E-mail to Orlando Hevia), your Editor imagined simple, special avoidance within SUBR28. As long as only a single data subcase (normal, recommended production usage) is involved, the change seems to work well. Any reader who might discover otherwise is advised to complain with an example.

Missing HP-GL output of batch-mode plotting with FOURIER ON first was noted publicly by Orlando Hevia of Universidad Tecnologica Nacional in Santa Fe, Argentina. His E-mail of the Fargo list server dated December 9th prompted the addition. It is worth explaining that the missing HP-GL as not an error, however. The code simply never was provided. Screen plotting had been added to Salford EMTP some years ago, and this automatically left erroneous or incomplete traces of HP-GL output.

Dependent switches (that master/slave business) was explained in the January, 1997, newsletter. What was not explained then was temporary, local storage in subroutine

SWITCH --- storage that was dimensioned to allow only 120 switches. More serious was the fact that vector JSLAVE was being used whether or not there was any switch dependence. The JAUG Chairman, Dr. Hiroshi Arita of Hitachi Corporation in Hitachi, Japan, is to be thanked for illustrating the problem in data that arrived February 20th. Correction was made the following day.

Ungrounded networks are **not** allowed by EMTP, and from time to time this upsets new users. One of the better responses to such a public complaint was contained in public E-mail by Joe R. Ribeiro of Florida Power and Light. The question came from Italy, and was about *"Simulation of ungrounded MV network."* Mr. Ribeiro explained as follows on January 15th: *"Que cosa e MV network? Just trying my Italian. In response to your question, may I suggest that in real life there is nothing that is actually ungrounded. There is the capacitance to ground. ATP will not work if there is no ground. So try estimating a capacitance to ground and apply it to your system."* Actually, ATP generally **will** proceed without any path to ground, but the user typically should not be satisfied with this mode of operation. ATP automatically will supply a high resistance to ground, but most likely this will result in a solution that is unbalanced. If the system is 3-phase, the intelligent user should be offended by the lack of symmetry. As explained in the Rule Book toward the end of Section IV-E, balanced capacitance to ground is a better alternative for a balanced or nearly-balanced network. If the network is balanced, the resulting solution then will be balanced.

Secret data has posed an increasing challenge to the investigation of reported program problems. Typically someone in industry first will report a problem involving some big data set. Developers will consider the summary words, and will agree that investigation is warranted. The complainant then explains that, unfortunately, he can not supply data that demonstrates the trouble because the data is secret. This began 4 or 5 years ago with a Canadian woman who was working at a Siemens plant in Germany. Most recently, Masahiro Kan of Toshiba Corporation in Japan has run into this obstacle with two Japanese companies that were using his GNU ATP. Responding to one on February 11th, Mr. Kan wrote: *"Dr. Scott Meyer could easily debug and correct the source code, if you provide the test data case to Dr. Scott Meyer. I know your data case is confidential, but I believe Dr. Scott Meyer will promise not to disclose your data case to other persons if you ask. Please consider this."* Your Editor confirmed this, expressing his willingness to sign a nondisclosure agreement, if this would help. More than nondisclosure, there would be no objection to a time limit after which the data would be destroyed. However, anyone wanting this sort of protection is advised to avoid BPA E-mail, since the BPA post office is remote, and backups of this are beyond user control. Finally, there could be agreement not to exploit data for any purpose other than correction of the program. Anyone interested in such an agreement to protect his data is advised to send a draft for review beforehand (before a problem becomes urgent, not after).

Pseudo-nonlinear elements sometimes are unable to follow transients smoothly. A famous message of output files begins: "!!! Tracking trouble with Type-99 or 98 element number I = ..." The missing integer (truncated on the right) was not defined prior to March 7th, when an erroneous zero value was noted while studying instability of data from Prof. Simon Davila of Simon Bolivar University in Caracas, Venezuela.

Branch cards to model multiphase transformers are punched by BCTRAN as illustrated by DCNEW-8. Prior to correction on March 24th, it was possible that an exponential scaling factor of 1.E6 or more (an even power of ten) was missing from shunt conductance. The problem first was reported by Labhesh Ganatra of Northern States Power in Minneapolis, Minnesota. Next, the trouble was confirmed by Huihua ("Maggie") Yan of Michigan Tech in Houghton. Developers in Portland were informed by Bruce Mork of Michigan Tech. His E-mail of the previous day had included Ms. Yan's observation that program printout was correct: *"Place the shunt resistance matrix across winding 1 with R-self [ohm] = 4.31288863E+06 and ..."* However, a big power of ten was missing in the punched cards : `1 GRIHA GRIHB .43128886296926` She wrote: *"Because the excitation branches are usually placed on the LV sides with smaller resistance, the problem wasn't seen before."* Well, the problem was traced to *improvement* by the former Leuven EMTP Center in Belgium. The three letters LEC appeared in columns 1-3, and GE (an indication of Manager Guido Empereur) appeared to the right of column 80 on lines at the location of the error. Once again, it appears that LEC tried to be creative while lacking understanding of the basic principles. Remember that famous discovery by Robert Schultz, as detailed in the January, 1994, issue ("*there is no indication that LEC ever understood what really was happening*")? That had to do with roundoff. In the present case, LEC tricked FLTOPT to provide one extra digit of precision. Whereas the field width for $VINTAGE,1 data is 16, those accounting geniuses in Leuven had requested optimal encoding with width 17. This seemed to work acceptably when no exponential was involved, but was in error by 1.E6 or more when this threshold for E-field encoding was reached. Your Editor reduced the 17 to 16, and the trouble disappeared --- albeit at the expense of one blank digit on the left of the 16-column number field). The corrected solution was returned to Prof. Mork the following day, and a corrected copy of the program was offered at the same time.

Pictures of lightning in Florida were mentioned in the preceding issue. Well, other sites on the Web promise such displays. Consider the following at the bottom of E-mail dated January 23rd from Tom Short of Power Technologies: *"See the PTI Lightning Photo Gallery: http://www.pti-us.com/pti/consult/dist/photos.htm"*