Can / Am EMTP News

Voice of the Canadian / American EMTP User Group

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Table of Contents

Salford FORTRAN Compilers

GRAPHICS.SUP within C:\ATP on the 486 at BPA provides storage for Salford disk file GRAPHICS that avoids clipping of the top of HP-GL output when WP 9 is used for display. This naming was performed February 19th in order to preserve Dr. Tsu-huei Liu's modification without impact on standard test cases (otherwise, the ATPHPGL.* output files all would change). A reduction of HPYOFF from value 1.0 to 0.25 was tested using DC-33. Quoting from Dr. Liu's note to your Editor dated February 12th, *"both the super title and Y-axis labeling appear fine now."* Previously, just the very bottom pixels of the 16-byte super title line were seen. About the Y-axis, apparently Dr. Liu was referring to the number beside the top tic mark. This, too, was being clipped as viewed within WP 9. About this problem, she wrote : *"the reason for using HPYOFF = 1 is explained in the Rule Book on page 1E-22. This was to satisfy MS Word 6. Today, our newer MS Word does not accept HP-GL at all."* More progress from Bill G? At BPA, the problem was noted because your Editor had wanted to display that plot of JMARTI fitting as first mentioned in the April issue. The .SUP alternative solved this problem (see the color graph elsewhere in this issue).

SPY @0 is the command to demonstrate the use of SPY PLOT as an interactive plotting program (see first mention in the July, 1991, issue). But during recent years, verification of interactive SPY, as opposed to batch-mode SPY of DC-57, has been lacking because there has been no need for demonstration at annual ATP short courses of Profs. Mohan and Carroll (the Universities of Minnesota and Florida, respectively). But then suddenly, during February, there was need to test the bar chart of new, universal VECPLT, and SPY @0 seemed to be the ideal way to do this. Unfortunately, when tried, this failed using the old VECPLT (of interest as the standard of comparison). Several corrections were required. First, there was need to change the precision of the .PL4 file (it now is double precision due to the CUSTOM PLOT FILE

declaration in DC-3 as explained in the July, 1995, issue). Second, it was necessary to add an extra GO (for the STEP command) to INCLSPY0.DAT in order to delay the reading of the .PL4 file until after it has been connected by $OPEN. Perhaps one or more possible SPY breaks has been added during recent years. Third, an error trap was added to BEGPLT to explain the trouble, should a user ever again try to read a file that has not been connected. Amazingly, the error flag of DBOS was not being set. Presumably lack of a file was too gross an error for DBOS to comprehend (how could any user be this stupid?), so your Editor added his own special trap and explanation. Within ENTRY LU4BEG, this will be seen if and only if the 19-byte date and time can not be read. Your Editor now verifies N9 --- the number of bytes actually read. If no file has been connected, this number will correctly be non-positive, it was noted. Fourth, thinking of the addition of SPY @0 to standard test cases (RUN.BAT), batch-mode execution was provided. This was not an issue for superior Apollo a dozen or more years ago, thanks to Apollo's smart and scrollable input window panes. Well, following a modification to CIMAG4, RUNTP SPY @0 executes correctly. The 4 screen plots --- 2 time plots and 2 Fourier bar charts --- look fine. But how might this easily be documented for DIFF at the end of RUN.BAT execution? Your Editor abandoned efforts to save the SPY window contents (easy interactively: just press **Esc**). In any case, this would not really have documented the screen plots. But the HP-GL or PostScript output of the new VECPLT should do the job admirably. So, still using the old VECPLT, work on SPY @0 was ended February 24th.

Fortran 95 from Lahey Computer

"Rent LF95 and a Beowulf cluster" is the title of an interesting story that occupies all of page 3 of the fall, 2001, issue of the Lahey newsletter. Rent a computer? It is as if the calendar had been turned back a quarter of a century. Computer rental seems to have returned, albeit for very specialized hardware: *"Eight 1.33 GHz Athlon computers configured as a Beowulf cluster; 512 MB DRAM per node; Linux kernel 2.4.3 ..."* Tsunamic Technologies, Inc. (TTI) of Orlando, Florida, was founded in February of 2000, and it now offers service for *"$1.09 per CPU per hour."* The Web reference is **www.onlinecluster.com** and, of course, Athlon is a product name of AMD (imitation Intel) .

Recall the addition of BN to FORMAT statements, in order to tolerate integer and scientific (E-field) numbers that are not right-adjusted within their data fields. This was the great idea of Stephen Boroczky, as mentioned in the July, 1998, issue. Yet, that was prior to acquisition of the F95 Lahey compiler. No, there is no Lahey F95 problem with the theory of BN addition (recall use was believed to be universal). But there certainly was a serious Lahey problem with BN malpractice until your Editor finally realized what he had done wrong. Lahey DC-60 differs from the F77 Salford copy (also used by GNU and Watcom) in that it illustrates dynamic control of the maximum number of coupled conductors. Whereas the LINE CONSTANTS declaration normally carries no additional data, for Lahey it carries the integer 85, which is the maximum number of coupled conductors. This value is used to ALLOCATE (dynamically create) the storage for matrices (as opposed to vectors) of the overlay. But Lahey ATP died in MAIN25 when it tried to extract this integer. Why? Because your Editor had erroneously keyed BN as BX. This was during July of 2000. But because only F95 was affected, and no F95 translation had been tested since then, the error was overlooked for a year and a half (amazing) ! Well, correction finally was made January 10th. In fairness, it should be mentioned that Lahey did explicitly display the right data card as part of the error message, although the accompanying complaint (*"Invalid binary character L was detected ..."*) did not mean much to your Editor for a while. Errors in FORMAT statements seem to be tricky for all compilers because some errors are trapped only at execution time --- by the operating system, not during compilation. Use of misspelled BN seemed to be one of these.

"Installation dependence of TABLES and TAPSAV was a GNU convenience that increased the complexity of future maintenance." This is the first sentence of a paragraph in the January issue. The same statement was applicable to F95 Lahey prior to the removal of installation-dependence on January 11th and 12th. Work on Lahey was more involved than the work on GNU, however, because of the use of F95. Translator F95ET required change because UTPF segment TABLES was being deleted automatically and internally. This special logic required removal. Also, TABLES required repositioning of the line that inserts the LABCOM COMMON blocks. This was because all USE must precede the IMPLICIT statement. Finally, January 15th, an important addition was made to TAPSAV. In effect, PARTIAL TABLE DUMPING (PTD) automatically will be used by F95 ATP, whether or not the user makes such a request in his data. There really is no choice. This is because of the delayed and conditional creation of some ATP tables. Recall a paragraph in the October, 2000, issue that began: *"Dynamic memory allocation for TACS or the U.M. will occur if and only if the modeling in question is required by the data being used."* Yes, *"this is a fundamental superiority of the F95 implementation,"* but it creates a problem for Robert Schultz's 1993 logic that dumps and restores all COMMON blocks. Clearly, what has not yet been created can not be dumped using WTURBO.INS The solution for F95 ATP is to use PTD, which has become a hard-wired feature. Finally, deletion of TAPOLD is being ordered by LAHEY95.DAT (a REMMOD request was added). This has the added advantage of speeding the optimized compilation (use of the -O1 qualifier) of MAIN00.FOR substantially. TAPSAV was less of a bottleneck because it already had been split into two nearly equal parts (see mention of TAPSIN in the October, 2000, issue).

TAPZER is the module that zeros ATP tables of LABCOM during the experimental dumping and restoring of ISTDMP. Recall TSTALL < 0 defines this, as explained in the April issue. Well, January 16th, TAPZER was discovered to be fundamentally incompatible with F95 for the same reason TAPOLD is: one can not zero what has not yet been created. The 2nd subcase of DC-7 died for this reason. So, TAPZER was given an F95-alternative that ignores universal ZTURBO.INS, and DC-7 finally was handled correctly 3 days later on the very first try. Yet, it must be noted that correct use does not imply correct code. Even if there were no code, handling would be correct! So correct DC7.LIS is not a sign that code is correct. Rather, it merely indicates the following: no longer is Lahey ATP trying to zero storage that has not yet been created.

Pisa-format .PL4 files dominated 3 paragraphs of the October, 2001, issue. Unfortunately, this work was not extended to Lahey at that time, when modification would have been much easier. In any case, troubled PRINTER PLOT output in DCNEW-21 was traced to defective Pisa-format logic, which was corrected January 11th and 12th. In effect, Salford HEADPI and LU4BEG were reconverted from DBOS to Lahey because your Editor found it too difficult to understand precisely what was wrong.

More about the Internet and E-mail

SMS is an acronym that indicates *short messaging service* -- a telephone feature that is becoming increasingly important. *"Wireless phones talk text"* is the title of a story found at the Web site of *The Seattle Times*. Dated November 20th, this explains an important extension : *"AT&T Wireless is offering subscribers the ability to exchange text messages with almost any digital wireless phone in the United States. ... SMS technology allows short notes to be typed out using the phone's number pad and sent to another wireless phone through the recipient's number. The recipient can reply by typing a response ... Until now, carriers allowed users to exchange text messages only within their own subscriber base."* Competing companies are expected to follow quickly. Curiously, other parts of the world seem to have avoided the historic American incompatibility and disadvantage: *"In Europe, where text messaging is extremely popular, all wireless carriers built their networks using Global Standard for Mobile Communications (GSM) technology, allowing messages to be exchanged between any set of phones."* Cost for AT&T customers seems moderate: *"subscribers can choose between a rate of 10 cents a message or $4.99 for 100 each month."* Why do the phone companies like SMS? *"Text messaging is much more profitable than voice calls for a wireless carrier because it uses the network more efficiently. If the network is busy, text messages are held and sent later, whereas a voice call requires an open circuit."* Yes, and there is obvious similarity to crippled E-mail. Recall the mention of *instant messaging* in the October, 1999, issue. Is SMS a direct competitor? Will the two competing services become indistinguishable if and when wireless telephones provide connection via the Internet? Hmmm ...

"Not Willing to Pay" is the headline of a story dated November 19th that was found at the Web site of *ABC News*. Dated November 19th, the subtitle is: *"Survey finds users seek out free alternatives on the Web."* It seems that *"the dot-com shakeout has resulted in some websites charging fees to access content, but few Americans have been willing to pay, according to a survey ... About 17 percent of Internet users, or about 19 million people, have been asked to pay for access to website content that used to be free, but half found free alternatives, while 12 percent pay, and the rest just decide to stop getting that content or service from an online source, according to a study by the Pew Internet & Life Project."* A later section is entitled: *"Too many sites, too little to offer."* I.e., few individual sites offer sellable content, and free alternatives remain.

Lernout & Hauspie (L&H) of Flanders, Belgium, first was mentioned in the April, 2001, issue. Recall speech recognition was the alleged specialty. But the stock price collapsed amid *"accusations of financial misdeeds."* The funeral of L&H was summarized in a story that was found at *The New York Times* Web site. Dated November 27th, this had title: *"Bankruptcy auction begins for speech technology company."* The story refers to proceedings that began *"yesterday afternoon at a New York law office. ... The auction has drawn a great deal of attention in the last month, since bankruptcy courts in Belgium and the United States ordered Lernout to liquidate. ... Some former Lernout competitors ... and even a subsidiary, Dictaphone, are among the bidders. ... In the last year, Lernout has ridden a downward spiral of accounting scandal, bankruptcy and the arrests of top executives."* It **does** sound as though Belgium might be more intolerant of financial manipulation than the USA. Good. Typically, American courts regard financial manipulation as a civil (i.e., non-criminal) matter. However, there does exist the famous counter example of Michael Milken at Drexel Burnham --- the billionaire king of junk bonds whose empire collapsed in 1990 following accusations of extortion and manipulation. Milken spent some time in jail.

Aliases are another --- and probably a growing --- unanticipated complication of Internet use. There seem to be Internet users who do not know what addresses are being used to funnel E-mail to them. Some systems have become this transparent, it would seem. An illustration is provided by Daniel Durbak of Power Technologies, Inc. (PTI) in Schenectady, New York. Now, here is a guy who has been forced to alter details many times. The April, 2000, issue mentioned that *"pti-us.com still works but the new stoneweb is preferred."* Well, in E-mail dated January 16th, Mr. Durbak showed your Editor what he receives as part of an E-mail header: *"To: Daniel Durbak/SWC/SCEC@SWEC."* He observed that this *"was generated by our network*

software. If I have several aliases, I do not know which one the sender used." Yes, the EEUG list server did **not** mail to SWEC. Worse still, the SWEC is about to be replaced: *"Please note that in the corporate world, IT software evolves at a much faster pace than ATP. It seems that every 2-3 years brings a complete revision of hardware and software. Yes, our corporate IT staff has been planning for months to re-do it all again, and in a few months we will have ... new e-mail programs and new e-mail addresses. So, we will repeat this activity again."* So what is the problem for the user group? Details of login must be sent to the registered address, which differs from the one used to make the request. The "Reply" button is not appropriate. The old address remains valid, even though it no longer is remembered or preferred by the sender.

"Rebooting the network at 12:00 noon today" was the *"Subject:"* of E-mail from the computer establishment at BPA (*"Help Desk Services"*) at 11:21 AM on February 12th. Two mornings in a row, the Internet had been unusable along with remote computer resources of various sorts. Your Editor concludes that complexity of the network has exceeded BPA's ability to maintain reliable support. On weekends, such trouble is a constant potential problem because no human might be available for rapid manual intervention. But network failure two business days in a row? This is almost unbelievable. Two days later, ominous signs remained: *"Due to system connectivity problems this morning … the entire network is being rebooted. ..."* Local support over here in PPOC 2 near Vancouver Mall is provided by Kris Korpenfelt, who clarified: *"I just found out that the **entire** network will be down ... I haven't yet heard the reason, just that everything will be down ... If everyone could please shut down their PCs no later than 11:45 and leave them off till 12:45, it would be most appreciated."* The previous day, Mr. Korpenfelt sent a message having *"Subject: Slow network problems."* He reported: *"a lot of people have been experiencing network issues today and it seems that a fix is in hand. It does involve touching every machine and rebooting ..."* Before this, there were various rumors and false explanations. For example, consider this E-mail advice from the Help Desk at 08:09 on February 11th: *"The issue at Van Mall is related to the implementation of Active Directory. ..."* Then, 13 minutes later, there was denial *"From: Veach, Lisa A - CISV-Z992"* who wrote: *"Van Mall problem is not AD related. Not Fog related. Network is working on a possible fix."* Some two and a half hours later, there was a falsely-optimistic report from *"Matt Thompson, Outage Coordinator."* Does the following not sound like a typical progress report from an airline to passengers who are stranded in their seats on a plane that should already have taken off at an airport? *"Fred Wilson called and said the networking problem was solved."* A little over an hour later, *"Wilson III, Fred - CIM-Z992"* explained: *"In Park Place 2 Switch ACS4 had a corrupted Router table. ... First I was told that because the lasers were not operational people could not log on. This is just not true, we have a backup system that will come on line. This morning I was told by the help desk they have fog so no one could log on at Van Campus. At this point I started to check the switches at Van Mall. Then I was told they could get on the network but the drives were not being attached (this would lead me to the server team for batch file problems) only later did I find out we still had a problem."* Yeah, well, the following morning, users still had the problem, and the following noon all equipment was being rebooted. Most peculiar was delay associated with local operations. In a DOS window of Dr. Liu's Pentium III-based PC, your Editor would EDIT a local file without trouble (no delay). Then, he would copy text to the paste buffer, and try to open another local file. It would take about 10 seconds for the menu (to name the file) to appear. This happened more than once, so there can be no mistake. Could MS networking really be this bad? Alternatively, is BPA somehow mismanaging it? Could Big Brother be monitoring every keystroke of every PC ? Hmmm ...

So, two bad days for networking at PPOC 2. But was this the end of trouble? No. On February 14th, Mr. Korpenfelt wrote: *"The network will be totally unavailable most of the day on Saturday. ... I'm not exactly sure what they are doing ... the situation will be pretty similar on Monday morning. No email or web ..."* That was at 14:29. Some 14 minutes later, there was explanation about *"Subject: Printer stuff ... The printers are still down here at Van Mall. It's a problem related to the network issues from this morning and both the networking teams and server teams are working on getting things going again."* Your Editor's conclusion: this problem seems typical of government, where no one ever seems to be held accountable for mistakes, and where there is no bottom line because government spends other people's money. Remember, readers, if government does not have the money to pay its own bills, it always can print more.

Watcom ATP for MS Windows

Multiple comment lines for .PL4 files were mishandled by Watcom ATP prior to a correction on January 14th. The complaint came from BPA contractor (and former employee) Jules Esztergalyos, who attached an illustration to E-mail dated January 11th. BPA's Dr. Tsu-huei Liu quickly confirmed that neither Mingw32 ATP nor Salford EMTP demonstrated the problem. Then your Editor found that index L4BYTE was not being incremented within installation-dependent CIMAGX for Watcom, so each new comment was being laid on top of the preceding old one (only the final comment was preserved). True, but this created a problem for REPLOT of DC-54. Finally, different corrections to CIMAG8 and CIMAG9 were made on January 22nd, and this reform involving L4WATC was extended to troubled F95 Lahey ATP to correct DC-51 two days later. The trouble proved to be more general than originally imagined.

DEC ATP for VAX / Open VMS

ATP for DEC VAX / Open VMS was recreated and tested during April --- 12 months after such previous work (see the story having the same title in the July, 2001, issue). Although BPA8 has disappeared, real VAX continues to be available at BPA in the form of BPA9, which Dr. Tsu-huei Liu can access from windows of her Pentium III-based PC. One window is for the DEC terminal emulator and the other is for Exceed brand software from Hummingbird Communications (used for inter-computer file transfers). Logistics were comparable to a year earlier. Years after the manufacturer of VAX has disappeared, VAX / VMS hardware and software continue to be available at BPA. Upon the completion of such testing, Randy Suhrbier is contacted, and he then ports the work to Open VMS of the Alpha-based computer that is used by Dan Goldsworthy, the lone remaining production user at BPA.

The START AGAIN use of DC-49 failed early in SPYING when NEXMOD = 2 led to use of a statement GO TO NEXTSN having undefined NEXTSN (the debugger show value zero). This was on the final time step (dT), as ATP wrote plot points to disk. How normal execution was possible during years past remains unclear. But correction today was easy and obvious enough. April 19th, NEXMOD = 0 was added to universal TABLES to ensure that the BLKCOM value being dumped always will be zero. It was observed experimentally that the extraneous value 2 had been defined during DC-49 simulation at the START AGAIN command, as tables were loaded immediately prior to re-entry into the dT loop for more simulation. Value 2 had been defined on the final time step of DC-32 simulation, when plot points were flushed from memory to disk file DC32.PL4 using the SPY SPACE command in the batch mode. This is because LUNIT4 was negative (to buffer plot points in RAM) and because UNFORMATTED .PL4 files were being used. Recall VAX ATP does not support C-like .PL4 files, and this caused the critical difference between VAX ATP performance and that of all Wintel PC-based versions (all of which normally exploit the superior C-like capability). To verify that there was no error peculiar to VAX ATP source code, L4BYTE was zeroed in Salford STARTSUP, making the execution of DC-49 abnormal. Whereas execution of VAX ATP had been ended cleanly by the operating system, Salford EMTP execution using BOTH would occasionally send garbage characters to the screen immediately after START AGAIN (the last normal output that was seen). The problem clearly was universal, not VAX-specific.

SET WATCH NEXMOD is the command of the VAX symbolic debugger that revealed the insight of the preceding paragraph. This critical detail is being written here in order that it will not again be forgotten. The advice of Randy Suhrbier was required this year when neither Dr. Liu nor your Editor could remember details. Neither could details be learned using the "Help" button of the interactive debugger. Fortunately, Mr. Suhrbier was reached on the second try (perhaps half an hour later). What else had better not be forgotten? Use of the `SET BREAK SPYING` command to stop at the top of subroutine SPYING. This is what was not possible during the earliest VAX years (1979 onward). At that time, we were force to use `SET BREAK %LABEL XXXX` where XXXX is a statement number. But there is not always a S.N. at the top of every subroutine. Avoidance of the S.N. is important progress that should not be forgotten. Of course, `SET MODULE SPYING` and `SET SCOPE SPYING` precede such use.

Simulation of DC-46 failed quickly because DC-45 had created three .PL4 files having the same name and higher version numbers. DC-46 was expecting the first of these, not the third (the one having the highest version number; the one that was being connected). Why was VAX ATP suddenly behaving in this different way? Your Editor could not imagine. Dr. Liu, however, suggested that the recent switch to use of KOMPAR = 4 might be responsible. This remains the most likely explanation. In any case, the need to change DC-45 was welcomed. Rather than use of the date and the time of day (possibly the WW I armistice) to name the second or later .PL4 file (established practice for Wintel-based versions of ATP), it is more logical to exploit VAX / VMS version numbers. This unifies all .PL4 files, should more than one be created. Of course, for normal production use, subcases will **not** be stacked, so nothing will change. But test cases **do** involve many stacked subcases, so they require special attention. So, Salford DC45.DAT (used for all other Wintel alternatives, too) was modified for VAX by the erasure of ICAT = 2 within the 2nd and 3rd subcases. Thus the problem was solved in data rather than code. Of course, DC-46 for VAX always has differed because of the non-C-like .PL4 file type. It required further modification because of the new 4th subcase. As mentioned in later writing about NEWPL4, the Pisa format for .PL4 files is not yet supported.

DCNEW-21 failed on a recently-enhanced diagnostic line at the top of PSSYMB because the output was too long for VAX / VMS. The operating system cleanly halted execution with an appropriate explanation. Of course, diagnostic printout normally is not used, but DCNEW-21 was an exception. DIAGNOSTIC printout purposely is turned on during CALCOMP PLOT of the 15th subcase. Correction was simple: the output line created by S.N. 3164 was split in two by the introduction of ",/," in the middle.

News About TACS and MODELS

POINTLIST of MODELS improperly loaded certain floating-point numbers prior to a patch that was applied to

TREAD on February 20th. For background on the function, see mention in the October, 1993, issue as well as Dube's PTLST1, 2, and E --- 3 of those 78 standard test cases that now are part of DCNEW-28. The first report of trouble came from Prof. Juan Martinez of UPC in Barcelona, Spain. His E-mail dated February 19th reported : *"We want to generate some information (random numbers) inside MODELS, using a routine developed by us. These random numbers should be later inserted in a MODELS section. We use PCVP, we generate the numbers ... However, MODELS ... does not accept quantities smaller than 1.0 whose first character is a decimal point. For instance, .456 is not accepted, but there is no problem with 0.456"* As an historical note, Dube used $INCLUDE whereas Martinez uses the more powerful (because it is dynamic) and newer $INSERT. But this is not the problem. Martinez was defining a vector of 100 cells in MODELS data. There were 100 lines, with the 7th being : "(7.0 , .394999673)" The trouble would have been easy to find if execution had died upon input. Instead, after all MODELS data had been interpreted, MODELS terminated work with one of its own syntax errors (which have KILL values between 401 and 513). Why was the trouble not reported years ago? Most likely your Editor upset Dube's fragile logic when he switched the WRITE1(output for MODELS.1 to optimally-encoded numbers. Yet, optimal encoding is progress, and there was no desire to backtrack by removing this. Instead, if a number begins with a space followed by a period, your Editor will internally add back a leading zero byte at input time. This is within TREAD, when in *comma mode* (Dube's terminology, as indicated by flag I7) for free-format data.

Slow MODELS simulation was not realized for years. While searching for something else (RTDS), your Editor stumbled across an indication of the popular perception during mid-1996. Three users at Furnas in Rio de Janeiro, Brazil, wrote the following to the Fargo list server in a contribution dated 2 July 1996: *"A summary of what Mr. Dube said follows ... When using MODELS to describe something that can be also described in TACS, TACS is 2 to 4 times faster than MODELS."* Reconcile this with what was discovered a year or two later (see the January, 1997, issue), or the writing about MATHCOMP this past year. For years, users were told that speed of MODELS simulation was not a problem, and they believed it. As with LEC accounting (see the July, 1993, issue), your Editor was fooled along with the average ATP user.

Line and Cable Constants

SUBR27, FRQDOM, CCEIGN, and NEWCBL are 4 UTPF segments associated with SEMLYEN SETUP and cables (both CC and CP). These were changed in small but noticeable ways on January 22nd by BPA's Dr. Tsu-huei Liu. First, the need for change to Semlyen output, which apparently had gone unnoticed for decades. At your Editor's request, Dr. Liu had been verifying F95 Lahey results when she noticed that one byte of numbers sometimes was missing in a .LIS file --- the right-most byte of those distinctive, dovetailed, triangular displays. So, numbers of the right half (the upper-triangular matrix) were shifted left by one byte. Following this change, DC-29 displayed many difference lines, but they all disappeared when -w was added to the command to run Mike Albert's FC. This ignores white space (any blank byte). DC-60 also displayed many difference lines, but dozens of them remained after -w was added. The numbers involved greater range. For example, -1.5746101E-18 was missing the 8 (completely wrong). Changes affecting cables began with the suppression of extraneous punched cards. If a cross-bonded cable is modeled as a Pi-circuit, distributed branch cards, too, were being punched. DC-28 illustrated this, and output now is smaller (no distributed branch cards are produced). Finally, DCNEW-29 illustrated another cosmetic problem: excessive interpretation of input data. When only one cable existed in a system, data from a nonexistent second cable was being displayed to the left of the vertical bar in column 51. F95 Lahey ATP was a good diagnostic tool for this because easily-noticed garbage was being displayed.

A warning message of CABLE PARAMETERS (CP) always had begun as follows: *"Conductor impedance may include numerical errors."* But the conclusion prior to May 10th was vague: *"The correct solutions for the modes show errors can be given by the very last modes."* At the request of your Editor, Dr. Liu studied the code and concluded that wording could be made more precise: *"One or more modes has modal velocity > 3.15E+8 m/sec."* Of course, the speed of light is just under 300 km/sec, so this limit includes about 5% excess. If the CP author (Prof. Akihiro Ametani of Doshisha University in Kyoto, Japan) ever wants to document theory of the warning, someone should publish it. In general terms, the concept seems simple. Your Editor understands that a conclusion drawn from Einstein's General Theory of Relativity is this: messages can not be transmitted faster than the speed of light. But if something this fundamental might be wrong with CP computation, why allow program execution to continue? Why not a fatal error, rather than merely a warning message? About modal velocity, is it physically observable? If not, someone should explain why not. Although the general concept seems simple, details seem extremely complicated.

Brain - Damaged MS Windows

Another Y2K problem of MS has been noted for the first time, nearly two years later. That 66-MHz 486-based DX2 PC used to support Salford EMTP at BPA uses MS-DOS version 6.22 as revealed by VER command. Keeping correct time never has been a problem, but for years, the date would sometimes fall behind. When a wrong date was

noticed, and when the error became objectionable (more than a day or two), the PC would be rebooted. Prior to mid-December, this always solved the problem. But suddenly, **Ctrl-Alt-Del** has resulted in a date that is old by one day. So, your Editor decided to set the date manually using the DATE command, which results in the following prompt: `"Enter new date (mm-dd-yy):"` But when "01" is sent for "yy" (the two year digits), it is rejected with the message "Invalid date." Then the prompt is refreshed. Yes, "2001" is accepted for "yy" but this involves 4 digits, not the two indicated by the DATE prompt.

"Sun files antitrust lawsuit against Microsoft" is the title of a Reuters story found at the Web site of *ABC News*. Dated March 8th, this summarizes continuing fallout from the conviction of MS in federal court last year : *"Sun Microsystems ... on Friday said it filed a private antitrust suit against Microsoft ... claiming that its business was hurt because the software giant engaged in unfair business practices. The suit stems, in part, from Microsoft's decision to ship its Windows XP operating system without any support for Sun's Java software programming language. ... In this new suit, Sun called for Microsoft to disclose and license the computing protocols and formats related to products such as Internet Explorer."* One day later, Chris Gaither of *The New York Times* provided more detail and background under the title *"Unhappy with settlement, Sun sues Microsoft."* The more business-friendly Bush administration had hoped to slap MS on the hand to end former Pres. Clinton's litigation, but nine states refused to follow this lead. They and companies who claim to have been injured by MS now are pursuing MS on their own. About Sun: *"The suit ... is the latest complaint brought by a competitor in the wake of a legal ruling upheld by a federal appeals court last June that Microsoft was a monopolist that used illegal methods to defend its position. ... Be Inc. ..., a failed maker of a computer operating system, and AOL Time Warner ..., the parent company of Netscape, have since sued Microsoft, using many of the court's rulings in their cases and expanding beyond them. Sun's suit also reaches beyond the appeals court decision ... Several analysts said the lawsuits were born out of frustration from the Justice Department's settlement, which many viewed as too weak to prevent Microsoft from dominating other businesses as it did the PC."* Meanwhile, MS is holding the money, and is expected to continue to delay in every way possible.

Compatibility of MS Windows XP with ATP first was reported to your Editor by Russell Patterson of TVA in Chattanooga, Tennessee. In E-mail dated March 11th, he wrote: *"I haven't exhaustively tested it but I have been able to run ATP (tpbig.exe size 1,131,520 bytes, dated 6/10/01, 7:07AM) with no problem on our XP test machine. I successfully loaded ATPDRAW 3.2, built a case and ran ATP from ATPDRAW successfully as well."* From the file size, Watcom ATP (smaller than GNU Mingw32 ATP) must have been involved.

New EEUG List Server

List server subscribers who forget their own E-mail addresses is yet another unforeseen complication of the Web form. Each user is asked to key his own 72-character subscription line, although your Editor generally reworks this in order to improve both quality and uniformity. For example, it is not rare for a subscriber to omit all details other than his E-mail address; or, he might also supply just his name, but no location; or he might supply all of the preceding, but no country; etc. So, your Editor reworks content to the right of the E-mail address. Even the E-mail address might occasionally be wrong because of a random mistake keying. Random mistakes were expected. What was **not** expected was that a subscriber would provide a different and wrong address. It happened November 22nd, when your Editor's confirmation message (a form letter) to gporter@nxs.com bounced (i.e., it was rejected). Upon examination, it was discovered that the registration came from nxs.net not nxs.com as keyed by the subscriber!

Should a warning about a computer virus be accepted by moderators of the EEUG list server? This was a topic of discussion among moderators January 8th. Of course, the information is not specifically related to ATP. But, in theory, the concept of virus warnings is appealing: the prevention of grief for some subscribers. In practice, there might be big problems, though, as summarized by Laszlo Prikler: *"I recall many such virus warning messages on Bruce Mork's listserver during its later years. Most of these were just hoaxes (false virus alarms). Until the ATP-EMTP-L list itself is involved in, or guilty of, distributing a virus, I think we should not accept such messages from subscribers. Of course, if any of you (moderators) think that a really serious virus appeared on the net (and you are absolutely sure that this is a virus not a hoax) you can post the warning to the list."* Gabor Furst emphasized his own ignorance, which is shared by your Editor and Dr. Liu (Can/Am user group moderators) as well: *"I am not really familiar with the pros and cons of this matter; I would prefer that owners of the list make the appropriate decision."* About the danger of hoaxes --- perhaps with the misinformation contributed innocently by a naïve subscriber --- your Editor observed: *"I remember what Laszlo writes about. Over the years, I criticized many things about operation of the Fargo list server. Suddenly, I realize that this is yet another problem that I failed to summarize in newsletters. Yes, hoaxes are everywhere on the Internet ... Hoaxes are as old as history. In that the typical report is second or third hand at best, the information almost always is anonymous, so can not be easily verified. This is precisely the sort of alleged 'information' about which moderators had better be careful."* Indeed, hoaxes are yet another justification for moderation of any big forum. As Prof. Prikler wrote, it should be acceptable for a moderator to issue (or approve) a warning of a virus **if the moderator is sure that the**

information is valid and appropriate. Note this involves a higher standard of understanding than for the average question about ATP, however. For ATP-related inquiries, lack of knowledge of the answer might be interpreted by a moderator as justification for the question. Not so for warnings about computer viruses.

ATP-related job offers were discussed by moderators around the end of January. The subject first was raised by Brent Chambers of MR Chapel Hill in North Carolina, who first sent E-mail to the Can/Am user group on January 30th. This explained: *"I am a technical recruiter with a job order for a Protection Engineer with EMTP experience. Please advise where I might post this position for your EMTP organization members to review. I do not want to circumvent your rules and protocol outlined at your site, but I saw no mention of rules for job posting. Please advise."* Your Editor responded: *"I can not recall having this precise problem before, although that research position in Leuven, Belgium, to be supported by Pauwels Trafo (a transformer manufacturer), had some similarity. The July, 2001, newsletter summarized the Pauwels story. I am adding copies to all moderators of the list server. If Pauwels was first, and you are second, I can only assume that there later will be other inquiries of this sort. Let's see if we can obtain a consensus about how announcements of job openings might best be handled. In case others want to learn more about your company, I had no trouble finding you on the Web. Your E-mail address suggested www.mrchapelhill.com and there you were (no problem)."* The third message of the series was a reply from Mr. Chambers: *"Rather than post job descriptions on your board, perhaps allowing a discreet link to our website to allow interested members to view opportunities would make more sense. Your members' comments are encouraged."* No moderator seemed opposed, although there were qualifications and questions. Gabor Furst seemed to observe that ATP had not yet been mentioned: *"I would think that clearly, and not ambiguously, ATP-related job offers could be posted. Such job offers will be few and far between."* Laszlo Prikler observed that special handling usually would be required: *"Because recruiters rarely subscribe to the ATP mailing list, such a job advertisement will probably be sent to one of us with a request to post it. So we always have a chance to consider details before the request is accepted."* Two moderators seemed impressed by American salaries, which your Editor had not noticed. Mr. Chambers responded with two advertisements for jobs, each mentioning *"$80-100K"* in compensation. More interesting to your Editor was the requirement *"non-smokers only"* (both jobs). It is common to prohibit smoking in buildings, but less common to deny employment to someone who smokes. Life is difficult for smokers in both Canada and America. Both countries have become increasingly intolerant of smokers during the past decade.

Clicking on a hyperlink within E-mail is the new and dangerous approval mechanism for list server mail. Both your Editor and BPA's Dr. Tsu-huei Liu were guilty of inadvertent (mistaken) approval of a message using this mechanism prior to realization of what had been done. The problem was summarized shortly thereafter in list server mail of Deputy Chairman Laszlo Prikler. Dated February 27th, this explained: *"I inform you that moderators got a fancy new tool for approving your contributions to the list. Approval is just a mouse click away with this new tool, but the older one was safer because it required sending the OK message as e-mail to LISTSERV."* Yes, easier but more dangerous. The proposed message no longer is part of the incoming E-mail. To see it, a moderator clicks in one place (on the icon of MS Outlook 98 as used here at BPA). If he clicks in another place, he approves the message for publication. Unfortunately, it is common practice of others (e.g., BPA management when it publishes *Hot Issues* as mentioned in the April issue) to use a link in place of an attachment. In this case, the list server subscriber shot himself in the foot. He misused the system by deliberately sending private E-mail to the list server along with explanation that the *"message is designed only for … Prof. Prikler"*. Moderation normally would have kept such a message private, but this time the protection of moderation failed. General advice to subscribers : Never point an unloaded gun at anyone (in this case, anyone is yourself). Alternatively, there is a rule of the radio and television business: when speaking in front of a microphone, never assume that it is dead. In any case, Prof. Prikler cleverly seized upon the inadvertent publication, informing others of what had happened. *"I've already replied privately to Mr. X, but a small part of this message has some public relevance, so I share it with you, too."* The subject was impending change of employment, and how it affects ATP licensing: *"When you are settled in the new company, please visit the EMTP web site … and fill in a new ATP license application on-line ..."* About disconnection from the list server, there was advice that differs from SIGNOFF as mentioned in the July, 2001, issue: *"send e-mail to the address listserv@listserv.dfn.de with a single line in the mail body: UNSUBSCRIBE ATP-EMTP-L"*

GNU ATP Installation Dependence

GNU Mingw32 TPBIG.EXE is too big to be squeezed onto a single 1.44-Mbyte floppy disk. This was the bad news from Dr. Tsu-huei Liu around January 20th. On the 26th, your Editor asked Orlando Hevia about the possibility of using a dynamic link library to split the program. But Mr. Hevia suggested three better ideas in E-mail later that same day. The first of these is not free, but it is cheap, and is startlingly effective for ATP: *"I have a program to pack .exe files. Named ASPack, it produces the following result :*

```
16/01/2002   6:19  1.026.048  tpbig.exe
```

Compare this with the original file and the PKZIP result :

```
26/01/2002  15:49  3.205.120  tpbig.exe
26/01/2002  15:49  1.329.466  TPBIG.ZIP
```

The time to unpack on the fly is very short." A Yahoo search for Aspack named the supplier to be EnTech Taiwan in Taipei, ROC. At www.aspack.com your Editor found

this summary: *"ASPack is an advanced Win32 executable file compressor, capable of reducing the file size of 32-bit Windows programs by as much as 70% . (ASPack's compression ratio improves upon the industry-standard zip file format by as much as 10-20% .) ASPack makes Windows 95/98/NT programs and libraries smaller, and decreases load times across networks, and download times from the internet ... Programs compressed with ASPack are self-contained and run exactly as before, with no runtime performance penalties."* Clicking on the *"Buy now!"* button reveals a reasonable price for this user group: *"Personal Licence ($29) -- one computer licence for private use and for authors of freeware applications who want to distribute programs in compressed form."*

Failure to terminate properly the final line of a data file might cause GNU ATP to mishandle that final line. This, in turn, could represent a fatal mistake, if a $INCLUDE file is involved. The story began with E-mail of the EEUG list server dated February 7th. Luciano Tonelli of CESI in Milano, Italy, reported the following strange behavior in a message having *"Subject: INCLUDE and 9999 card."* He explained: *"The part ... I INCLUDE is the non-linear characteristic of a transformer, and this ends with the special card 9999 in column 16. It seems that the last card is not interpreted by ATP because a spurious character 'C' is inserted at the beginning of the card. As a result, execution aborts with the message 'fmt: read unexpected character ...' If 9999 is put below the $INCLUDE card, everything goes as expected."* Later that same day, an explanation was provided by Orlando Hevia of UTN in Santa Fe, Argentina: *"I can reproduce the problem. But it is not an ATP problem; it is a data problem. The line with 9999 must be terminated with a* ***<CR>****. With this last* ***Enter*** *key pressed at the end of the line, ATP reads correctly the INCLUDEd file."* Your Editor then studied the problem without any $INCLUDE (which only complicates the basic question). The question is this: how is END= of a READ statement handled by different program versions? To test this, for data he used :

```
Line 1
Line 2
```

Beginning with DOS EDIT under MS Windows 95 at home, your Editor was unable to create a data file that was improperly terminated. Automatically, the final line is terminated by 0D 0A representing **<CR><LF>** even when the **Enter** key was not pressed after the "2". This is seen using Vernon Buerg's freeware LIST (**Alt-h** is pressed to display the character codes of all bytes). The same seems true of MS Word 7. The selection of *"Text only (*.txt)"* within the *"File | Save as"* button created disk file TEXT.TXT and this looks just like the manually-created DOS EDIT file. But MS Notepad is different. Notepad creates a file (this is NOTEPAD.TXT) with nothing following the final key ("2") that was pressed. Still, Salford OVER1 responded normally, as did Watcom ATP at BPA. No line was lost or mishandled on input even though there are only two lines, and no **<CR><LF>** ends the second of these. Both Salford and Watcom ATP used END=1766 while trying to read a nonexistent 3rd line. This is normal. Why is GNU Mingw32 ATP different? The problem is with the READ statement itself. If the line is not terminated properly, the END= branch is taken. Yet, the line has been read, and is available. If program developers wanted to go to the trouble of initializing with recognizable garbage before the READ, this situation could be detected and repaired. But thus far, there has not been adequate incentive. The medicine would cost too much. The cure would be too expensive, your Editor believes.

A8 comment information (the UTPF ident) of an ALPHANUMERIC statement was being passed through to output FORTRAN by the VAX translator prior to improvement on March 9th. Recall the October, 2001, issue mentioned an earlier improvement: the destruction of comments within INCLUDE files. Slowly, all comment information is being removed. Slowly, the VAX translator is being upgraded to the standard of the Salford translator in this respect. Since year one of machine translation (1974), this has been the theory: translators destroy all comment information. Originally, this was important to save disk space. More recently --- since DCG / EPRI EMTP commerce began in 1984 --- need for security has provided the more important justification. The following day (March 10th), documentation of INTRINSIC declarations was suppressed from output. This was another unnecessary detail of VAX translator output.

Optimally Encoded Output

This is a continuation of the story that began in the preceding issue.

Occasional Salford DC*.LIS file output was affected by the preceding inconsistency. Most commonly, the change was to the "Time" column on the left. For example, prior to reform, note the difference between step 4 and step 40 of the Salford solution to DC-7 :

```
     4   .1E-3   187866.4209          0.0  ...
    40   1.E-3   174797.9793  367946.6333  ...
```

Of the 96 standard test cases DC*.LIS files, only 16 were modified selectively this way. Less common were extreme numerical values of some variable (e.g., the 1.E-33 for LOAD current in DC-42) .

The preceding mention of 16 changes to DC*.LIS was for Salford. GNU Mingw32 was the same. But Watcom involved fewer changes. The Watcom files were handled by Dr. Tsu-huei Liu, and her records show only 12 changes (7, 9, 13, 19, 26, 30, 42, 57, N15, N17, N26, and N28) .

Only single-digit E-field numbers are affected by the logic change, and the same logic applies to all ATP versions. Left in the UTPF is logic that converts any x.E to .xE It was found that this produced far fewer modifications to DC*.LIS than the alternative, which is preserved at home as FLTOPT.1PT Rather than esthetic

considerations (your Editor prefers the x.E alternative), minimization of changes to ATP output was the primary consideration in making this choice. Continuity with the past continues to be important to your Editor. Wherever possible, historical discontinuities are being minimized.

ATP Licensing Problems

Tom McDermott of Electrotek Concepts was the second employee to write about TOP. The story of the three preceding issues continues. Dated June 13th, 2001, E-mail from temc@electrotek.com had *"Subject: ATP Support in TOP"* and it involved copies to 7 others (presumably all Electrotek employees). The body of this message from Project Engineer McDermott follows in its entirety (following 5 paragraphs) :

"We read your comments on TOP support of ATP output in the January 2001 CanAm Newsletter, which is available for download in the public section of your Web site. Electrotek does not have the ATP program, and all of the output files in our possession have come from other users. For engineering work, we are using EMTDC, an old version of the translation that we did for EPRI (and have permission to use), and an in-house transients program. This explains our lack of current interest in ATP licensing.

TOP has been a free download for approximately 2.5 years. The only licensing restriction is that it may not be redistributed as part of another product or package. The business value to Electrotek comes from Web site traffic and name recognition, but we incur significant costs in supporting that. To date, there have been 2835 downloads and 1341 of those said their primary interest was 'viewing simulation data', as opposed to 'viewing measurement data', 'other', and 'no response'. I wish I had more precise information, but still, I'm confident that several hundred of the TOP downloads were primarily to view ATP output, and that this represents a significant percentage of the total ATP users. When an ATP user submits a PL4 file that TOP won't read, we try to fix the problem and post a new version within a few days. There were a couple such instances between one and two years ago.

By the way, regarding the user's question referenced in your newsletter article, TOP does not have a limit on the number of nodes or branches.

We think that terminating, or freezing, the ATP support in TOP would be a disservice to many ATP users. Would you consider publishing the ATP output format and a suite of test files?

One can find many examples of open file specifications in the commercial software world. For example, Microsoft Excel files can be read with an SDK that is available for about $50. Electrotek is also moving in this direction with the IEEE Power Quality Data Interchange Format (PQDIF) initiative. PQDIF is the underpinning of data files in Dranetz-BMI's new generation of power quality instruments. Also, consider the IEEE Comtrade format. The clear trend, driven by customer needs, is toward open data exchange and tool interoperability. This might be compatible with your conditional open policies on ATP, and not infringe on the core proprietary areas of ATP."

EPRIsolutions, Inc. seems to be interested in ATP. In E-mail dated February 21st, Rick Dong wrote: *"I am from EPRIsolutions, different from EPRI. I am not a user of EPRI/EMTP, can I apply an ATP license for my group. If not, can I apply the license on behalf of my self."* Note the erroneous implicit assumption that EMTP commerce disqualifies a person from ATP use. Your Editor responded the following day. About being different from EPRI: *"How different? What is the relationship to EPRI or others who might be involved in EMTP commerce?"* About not being a user of EPRI's EMTP: *"This is not relevant one way or the other."* About application for a license for his group: *"What is your group? What is your organization? Who are you? It is hard to believe that the first 4 letters of the name (EPRI) are an accident."* About the possibility of a personal license: *"we took a shot in the dark and tried to connect to www.eprisolutions.com It worked. You write that you are 'different from EPRI.' Well, sort of. You are in a 'wholly owned subsidiary of ...' It is hard to imagine how this would help your case. You work for one of the 'EPRI family of companies' (left margin of the home page). Note that ATP is available to anyone, including EPRI, as explained in a story in the January, 1992, newsletter (copies can be downloaded without a password from several storage sites on the Internet (e.g., EEUG's). Also, read our form letter at www.emtp.org -- the part about 'reciprocity' (paragraph 4). ATP might not be available to you free of charge, but it certainly is available to you (or anyone else)."* A later observation is this: at the bottom of Mr. Dong's message is the snail mail address *"3412 Hillview Ave."* in Palo Alto, California. This also happens to be EPRI's street address, as can be seen at the bottom of the *"Contact us"* display of www.epri.com (see top margin). Final point: The opening paragraph of the EPRIsolutions home page states the following: *"Our primary focus is delivering solutions to you using the technologies, processes, and information developed by EPRI ..."* Needless to say, EPRI had nothing to do with ATP, and little to do with the development of EMTP, so the latest interest in ATP is not at all appreciated.

Power Company Politics and Religion

Tom Field in Birmingham, Alabama, was mentioned in the April issue. As part of pre-publication review, he

responded as follows on February 27th: *"The articles that I am mentioned in look correct. However, I am an employee of Alabama Power for now (although this may change again in a couple of months with the formation of the RTO, so I do not know if it is worth mentioning)."* The change from Southern Company Services to Alabama Power is not great because Alabama Power is a member of the family of Southern companies. Switch to a new Regional Transmission Organization (RTO) would be a bigger step, however, and it would require ATP re-licensing. Across the USA, turmoil of the industry continues in spite of the incompetence demonstrated by California politicians (see the April, 1991, issue onward) .

BPA's E-mail filter continues to interfere with normal business. Remember how .ZIP attachments were removed, for a while, as part of the year 2000 hysteria? This was summarized in the April, 2000, issue (see *"The Millennium Award for Y2K Stupidity"*). Well, the concentration of stupidity seems to have shifted from attachments to the body of E-mail. Received *"From: postmaster@bpa.gov"* on January 16th was a short message having *"Subject: Spam mail warning notification! (Improper Phrases)"* Inside the note was explanation that *"The following mail was blocked since it contains sensitive content.*

Source mailbox: <prikler@vmt.bme.hu>
Destination mailbox(es): <thliu@bpa.gov>
Policy: Improper Phrases
Action: Quarantine."

The summary conclusion is: *"Recipient, Content filter has detected a sensitive e-mail."* Of course, your Editor was curious, so later that same day he showed Prof. Prikler what had happened, and asked: *"If you would PKZIP a copy, and attach the archive to E-mail, we should learn how dumb (my guess) or smart (possible) BPA's filter is."* The following day, Prof. Prikler explained about his writing: *"There were some sensitive phrases in the mail: BPA, BPA officials, responsibility, Kristian etc. ... :>)"* Really. Dr. Tsu-huei Liu, too, was impressed, and it was she who sent a copy *"To: Miner, Rex - CISU-Z992"* in BPA's computer establishment on January 18th His response later that same day follows: *"We took a look at this e-mail and were able to determine why it was blocked. There was part of a word that was misspelled and matched a word in our dictionary as being improper. We have changed the rules to match whole words only. This should prevent this from occurring again."* So, if the problem with .ZIP files was Y2K hysteria, is this now WTC (World Trade Center) hysteria?

Lack of common business sense seems to have been demonstrated by BPA once again --- this time in recent dealings with Enron. Internally, BPA had taken pride in being a debtor rather than a creditor (i.e., BPA owes Enron money). But the *Seattle Times* painted quite a different picture in its February 8th story entitled *"No easy escape from Enron: BPA may be stuck with costly contract."* According to author Hal Bernton, BPA *"appears stuck with buying $700 million worth of electricity from Enron at a price nearly double the current market rates for an equivalent amount of power. By contrast, at least two other western utilities have walked away from expensive, long-term contracts with Enron."* The difference is an escape clause in a power contract: others had enough business sense to add one whereas BPA did not, it would seem. But have others really escaped? The Enron bankruptcy judge will have a say, and appeals could take years. There is some similarity to the WPPSS default (see the April, 1995, issue), which dragged on in the courts for more than a decade, your Editor recalls. Whenever a lot of money is involved, there is incentive to litigate, of course. In America, barring some exceptional circumstance, this could take many years.

Pocket Calculator Used by PCVP

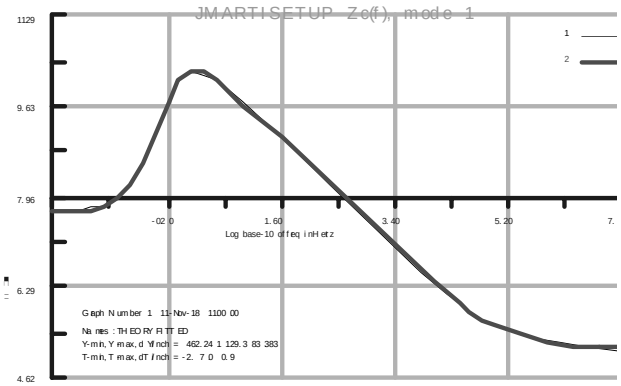
TABLE LIMITS is a new optional request that can be added to a $PARAMETER declaration. It permits the user to define his own limits for $PARAMETER storage. Any ATP version should process the request, although only an F95 version such as Lahey ATP actually will use the 4 associated integers. All F77 ATP versions will continue to use the same old fixed limits, which also serve as default limits for F95 code in case there is no request for specific limits. Most important, the F95 ALLOCATE of $PARAMETER storage occurs if and only if data involves one or more normal $PARAMETER block. I.e., like TACS, rotating machinery, and Kizilcay frequency dependence, F95 ATP is burdened by $PARAMETER storage if and only if this feature is required by data. Another restriction (at least initially) is this: only a single request for table sizes is allowed. If present, this request must precede the first normal $PARAMETER block that is encountered during a given ATP execution. I.e., tables will only to be sized once per program execution. If not first, a request for re-sizing will be processed and ignored. Code for MATDAT was written February 3rd --- the same day one line of illustration was added to the 18th subcase of DCNEW-21.

Vector Plots of JMARTI Fitting

The need to convert VECPLT to CALCOMP PLOT graphics was realized during the morning of February 8th as your Editor and Dr. Tsu-huei Liu studied why JMARTI fitting did not produce HP-GL output as a normal batch-mode plot would. There was a desire to provide an illustration in the April newsletter, but HP-GL output could not be found. This is why (how quickly one forgets such details) : VECPLT is different, and separate from batch-mode plotting. VECPLT began using just Apollo screen graphics. This was during the mid-‘80s, years before present-day alternatives for hard copy existed (first mention of HP-GL in newsletters was located in the April, 1990, issue) . During early 1990, the Apollo screen graphics were converted to Salford screen graphics (see

mention in the January issue of that year). For a while, there was a Watcom version of VECPLT using Watcom's DOS extender WAT4GW. Later, a GNU version was created using those great, free, DISLIN graphics. This is what most recently has been used with F95 Lahey ATP, too, although DISLIN graphics are **not** free for this version. Unfortunately, each copy of VECPLT was different, and none relied upon the standard CALCOMP PLOT graphics that would have provided HP-GL and PostScript outputs automatically (if not vetoed by NOHPGL = 1 and NOPOST = 1, respectively). Note the October, 1993, issue indicates that Robert Schultz had supported PS output of SPY as part of his Schultz Revolution, but such code never was moved into the UTPF. Work on conventional (non-Fourier) plotting of VECPLT was completed using Salford within about a week. But that was the easy part. Substantially more involved was conversion of the code to produce a bar chart for the FOURIER subcommand of the PLOT command of SPY. Eventually, in-line code was replaced by a CALL to universal VECBAR of batch-mode plotting. Before this was done, however, VECBAR was reformed by the elimination of DRWBAR (the following issue should summarize details). Work ended February 26th as your Editor was satisfied with performance using SPY @0, which produces 2 bar charts. The first of these, which is limited to harmonics numbered 0 through 9, is verified at the end of RUN.BAT following the last of the DC*.DAT standard test cases. Immediately below should be found the graph associated with JMARTI fitting --- also produced from the HP-GL output of the new, universal VECPLT. The following day, Mingw32 ATP confirmed operation. However, this was prior to the destruction of Mingw32 VECPLT. The final step --- use of Salford VECPLT as part of Mingw32 ATP --- first produced believable (although not yet perfect) results for the ROLL-ing PLOT of DC-57 on March 20th. Because DISLIN graphics are different from CALCOMP PLOT graphics, former ENTRY VECEND has become an installation-dependent SUBROUTINE for both Salford and GNU ATP.

That color plot that was missing in the preceding issue now can be shown. Using WP 9 as an intermediary, the following was produced by the 4th subcase of DCNEW-3 :



PostScript output had not been a concern of your Editor, so it came as no surprise that this was imperfect. Trouble was documented in a note from Dr. Tsu-huei Liu dated March 13th: *"One minor bug remains for .PS output. 'showpage' should be written to the .ps file at the end of each plot. I.e., PSTEND should be called at the end of each plot."* Yes, without showpage, GhostScript was superimposing all the plots of JMARTI fitting. So, the following day, CALL PSTEND was added to VECPLT below S.N. 7250 where screen graphics already were being saved. That was easy enough for JMARTI fitting, but the ROLL-ing SPY PLOT of DC-57 required more work and new variable KSHOWP before PostScript output DC57.PS looked believable within GhostScript.

A special problem of GS also was corrected on March 14th, although Dr. Tsu-huei Liu had noted it some days earlier. GS would execute normally if Orlando Hevia's plot of line/cable cross-sections was enabled by KROSEC = 1. If not (value 0), GS would die with a complaint about the font. Dr. Liu explained that the code to support JMARTI fitting was using a font before any font had been selected. So, prior to the beginning of output using GRIDXX within VECPLT, a "basefont" declaration was added to PS output. Actually, this was the second of two tries. Previous addition to PSNEWP worked, but had the disadvantage that it added a line for non-JMARTI use, and this affected the comparison of 4 standard test cases. To avoid such unnecessary change, the patch was moved to now-equally-universal VECPLT. If `"basefont % VECPLT, 3675"` is seen, this is the reason. Note Robert Meredith's scheme of location (module name and statement number) continue to be used.

Hoidalen Improves ATPDRAW

"ATPDraw version 3.1 is now available to download" was the *"Subject:"* of semi-public E-mail of the EEUG list server dated January 7th. Deputy EEUG Chairman Laszlo Prikler began his announcement as follows : *"Dr. Hans Kristian Hoidalen informs you that a new version of ATPDraw (version 3.1) is now available for licensed ATP users via the secure storage at EEUG web site ... Password is required, as usual. ... Next comes Dr. Hoidalen's original message and a quick installation guide."* Under the title *"New features and bug fixes,"* Prof. Hoidalen's attached writing includes the following :

") The Verify module in the Line / Cable dialog is extended to support calculation of steady state sequential impedances and line charging to enable easy comparison with benchmark data. The line model frequency scan is somewhat improved ...*

**) Grouping is extended to allow nonlinear characteristics as external data. This makes it possible for instance to create a 3 phase nonlinear inductance. ...*

**) 23 new components are added. Most are found under*

TACS|Fortran|Logic/Math and are special fixed fortran statements. ...

**) An old bug related to transposition objects is fixed. Transpositions can now be inserted in the circuit in an arbitrary position ...*

**) An old bug related to splitters is also corrected. Two splitters can now be connected back-to-back (3 phase side) without any other connections at this point. ... Revised User Manual … will be available soon."*

Impact of HFS on ATPDraw was proposed by your Editor in E-mail to five other persons on January 22nd. This was to solve the other problem, named ARC1, that was supplied by Luciano Tonelli of CESI. Rather than an ATP problem, ARC1 demonstrated an ATPDraw problem. ATPDraw was demanding a service that ATP had not at that time been coded or designed to provide: the sorting of frequency-dependent data for series R-L-C elements (or, at the very least, the blank card that terminates such data). Your Editor wrote: *"The 1st 3 lines are right, and are recognized by sorting logic; The same goes for the last 3. But that exceptional, long line in the middle is not recognized by ATP, and this is the problem. Question for Hans: Do we want to extend data sorting by class this way? If so, we need a good key word. I would suggest HFS RLC simply because it is short, unique, and emphasizes that this is a part of data if and only if HFS is used. Not part of this illustration would be a /HFS RLC request, which would precede the F-dependent data points for series R-L-C. This assumes that ATPDraw would create such data cards for the user."*

Creative ATP Modeling

"Negative R, L, C in ATP-EMTP" was the *"Subject:"* of E-mail of the EEUG list server dated November 1st. The inquiry came from Marjan Popov of TU Delft in The Netherlands, and it involved sufficient ambiguity so as to be difficult to answer quickly: *"I want to ask if there is a version of ATP-EMTP that can work with negative R, L and C? The reason for this is ... we tried to fit the frequency characteristic of a transformer winding by R, L, C sections over a wide frequency range. The fitted characteristic shows good agreement with the measured one, but some of the calculated parameters are negative."* Recall negative R or L of a series R-L-C branch was mentioned in the January, 2001, issue. That was limited and clear. But there exist trickier ways to hide negative values, and these might, or might not, trouble ATP simulation. In all generality, the subject is extremely complicated. For the better part of three decades, recall that data for the 3-winding saturable TRANSFORMER might, or might not, be troubled by instability (most recently, see mention in newsletters dated January and October, 2000). To Marjan Popov's question, two experienced users offered answers later that same day. Neither denied the possibility of negative parameters. First, Dr. Antonio Carlos Siqueira de Lima of ONS in Rio de Janeiro, Brazil, advised: *"One option to achieve a negative resistance is to use an operational amplifier. The ideal op amp that exists in ATP can do the trick. The work left would be to choose ... parallel / series resistance. Several electronics books present one or two examples ... I am not sure whether negative inductance / capacitance can be achieved by the same technique or whether this would increase the complexity of the simulated circuit."* Of course, creation of the op amp in ATP was inspired by Masahiro Kan of Toshiba Corporation in Japan as documented and illustrated in the 4th subcase of DCNEW-22. The second response came from Dr. Michael Steurer of CAPS at Florida State University in Tallahassee: *"Any version of ATP can 'work with' negative R, L and C values, although there are no native models for such elements available. However, other elements can be utilized to accomplish negative R and L values. ... In fact, the most common element used is probably the type 91 TACS-controlled time-dependent resistor. This component operates properly with positive and negative R values. I used it, for example, within an average model of a power electronic converter to simulate the reverse real power flow --- meaning that real power is provided to, and not demanded from, the AC system by the converter. Negative L values can be achieved by scaling the non linear L ... A non linear element is generally used to represent a non-linear device characteristic (flux-current for L and, if existent, displacement flux - voltage relationship for C). Utilizing only one (therefore linear) segment of the more generally nonlinear characteristic multiplied by -1 leads to a negative linear L (or C). Here is an example for a linear inductor ... However, the question remains whether the solution is stable ... and/or such elements actually make sense from the physical point of view (what is a negative inductance, anyway?). For example ... The reason for this instability is obviously the positive feedback that is introduced into the integration by the negative L ... To me it is clear that negative circuit elements always carry the potential of introducing instabilities and shall therefore be avoided whenever possible."* Amen (proceed only with extreme skepticism) .

An LIOV (Lightning-Induced OverVoltage) program was *"developed by the University of Bologna and the Swiss Federal Institute of Technology."* This according to E-mail dated February 4th, which first expressed interest in a possible coupling of LIOV with ATP in order to perform enhanced simulation. Messrs. Luciano Tonelli and Stefano Malgarotti of CESI in Milano, Italy, explored the idea in a private inquiry involving both EEUG and the Can/Am user group. ATP source code was mentioned, and the following day, your Editor provided general advice that is applicable to other programs and organizations as well: *"Typically, only a small amount of source code is required because the interface with ATP is localized. A good example was provided by Concetta Pragliola of Ansaldo Transporti in Naples. This was for the connection of ATP to Ansaldo hardware, as described in the October, 1990, newsletter. Only the single subroutine ANALYT was required. This*

was comparable to what is required for compiled TACS: a single, small subroutine." The CESI engineers had wanted to *"modify the voltage and current sources in ATP in order to make them read the results coming from the finite-difference integration of the coupling equations integrated by the LIOV code."* Your Editor's reaction was: *"This begins to sound more like what Concetta did. Interface with ATP sources is easy, and is nearly 3 decades old. SUBROUTINE ANALYT is all that is needed ... GNU Mingw32 has the advantage of free compilers. It is not the greatest system for development, but simulation certainly is fast ... If you use the same version as ATP developers, object files should be compatible. This is an important detail. Recall Harald Wehrend's trouble using Watcom C, which he linked with object files from FORTRAN-based ATP."* Of course, Mingw32 assumes use of a Wintel PC. GNU Linux as used by Masahiro Kan and Orlando Hevia should work just as well if one wants an open alternative to Bill G and MS Windows.

A zig zag transformer was mentioned in general terms in the October, 1996, issue. For the record, a published reference now will be provided. Deliberately, spelling is being varied in order that a search using either a space, a hyphen, or no space will locate the key word. In E-mail of the EEUG list server, Orlando Hevia answered an inquiry about how to simulate a *"zig-zag grounding transformer"* (the *"Subject:"*). Dated February 5th, Mr. Hevia's advice follows: *"I recommend to users the paper by Peter Riedel, 'Modelling of zigzag-transformers in the three-phase System', Proceedings of the 18th EMTP users group meeting, Marseille, May 28-29, 1990. But the paper is not easily available. I have a PDF version, scanned from the Proceeding, and it is now available at the EEUG secure Web site … English version: ezigzag.pdf ; Spanish version: zigzag.pdf"*

Subharmonics Allowed in HFS

HFSPLOT and WHFSPLOT are the HFS plotting programs from Gabor Furst, as explained in the October issue. In E-mail dated November 22nd, the author reported that these postprocessing tools for power quality studies *"are being modified to take into account the changes allowing subharmonics. They will recognize the default fundamental frequency as 50 or 60 Hz and allow the user to change the fundamental frequency to be used in the calculation of harmonic indices and the plotting of the wave shapes."*

Subharmonic number h --- a new symbol for use within $PARAMETER blocks --- was the request of Gabor Furst in E-mail dated November 23rd. This would be for HARMONIC FREQUENCY SCAN (HFS) use that is combined with POCKET CALCULATOR VARIES PARAMETERS (PCVP) as illustrated by the 3rd subcase of DCNEW-26. Work ended November 25th, when substantial changes to six UTPF segments (POCKET, REQUES, OVER1, OVER4, OVER8, and OVER11) finally were accepted. HFS author Furst had supplied disk file PARATEST.DAT as an illustration. Following the addition of subharmonics (note the Type-14 frequencies .333 and .6667), this was added to DCNEW-21 as a new 19th subcase to illustrate the new capability. In fact, handling PARATEST in isolation was not so difficult. But handling it as the 19th subcase of DCNEW-21, and continuing to produce correct solutions for all old data, proved to be more of a challenge. In the .LIS file, note the treatment of "Step" for the subharmonics. This is new for frequency scans: a floating-point step number for those cases where the harmonic number is not an integer.

MINIMUM HARMONIC NUMBER (MHN) is a new declaration that is required for Gabor Furst's HARTEST. Use can be found in DCNEW-21 along with explanatory text. It would be nice if this declaration were not required, but your Editor can think of no easy way for the user to avoid such early, explicit declaration of the beginning frequency of the loop. Yes, this is redundant. The starting frequency is present in data, and will be known as soon as the last source card has been read. Unfortunately, harmonic number h generally will be used within a $PARAMETER block that precedes the reading of source cards. For example, in HARTEST it must precede branch cards that are to be made a function of frequency. By the time minimum h is known, it will be too late; h will already have been used. So, the MHN declaration is required to initialize symbol h. A pain? Yes. But at least there should be no danger. If the user forgets his MHN declaration, attempted use in a $PARAMETER block should result in the following error termination: *"Halt in POCKET. The MINIMUM HARMONIC NUMBER request must precede the 1st $PARAMETER reference to H."* An alternative mistake would be for the user to have an MHN declaration, but to provide the wrong frequency, in which case ATP should issue the following error message: *"Halt in OVER4. Initial HARNUM does not agree with the actual minimum source frequency."* A match within tolerance EPSILN (typically 1.E-8) is required, so full precision always should be used.

The official announcement of modifications to support subharmonics was made by Gabor Furst in E-mail of the EEUG list server dated December 11th : *"I would like to report a significant addition to ATP's HARMONIC FREQUENCY SCAN (HFS) option. Following comments on the desirability to include sub-harmonics and inter-harmonics (non-integer harmonics) in harmonic analysis -- which may be caused by different power electronic devices such as cyclo converters, PWM drives etc. -- these sources have been included as permissible entries in the list of sources. … The credit for the implementation in ATP coding, as usual, goes to Dr. Scott Meyer. The ATP version for the inclusion of these features is in TPBIG dated November 26, 2001, or later. The program is, of course, downward compatible, so that old HFS data files can be*

used without any change. … Corresponding changes have to be implemented in the special HFS post processing and plotting programs … Like changes to ATP, these changes too turned out to be not trivial. The upgrading of Hfsplot has been abandoned, but users not interested in sub- or inter-harmonics can continue to use it as before, with new or old .PL4 files. A temporary version of an upgraded Whfsplot should be available the first week in the New Year; send your request to me at any time … In the old HFS version, frequency dependent components could be used in conjunction with the POCKET CALCULATOR and $PARAMETER, by varying the impedance as a user specified function of KNT, which held for this purpose, the harmonic order h. In the new version, the frequency dependence can be specified as a function of H, where H can be a sub- or inter-harmonic. Some examples will be provided in the updated HFS.ZIP archive on Dr. Funaki's FTP site in Japan, together with the examples given in sub-cases 16, 17 and 18 of the DCNEW-21 benchmark file."

Orlando Hevia explained about his own interactive plotting program GTPPLOT the following day,. It *"can process subharmonics and interharmonics, but it now is in test stage. If some expert user is interested in testing ... (Mingw32 version for now) I will send the special version."*

Frequency Scans and Harmonics

Two or more sources that are connected to the same node caused trouble for HFS prior to January 20th. Yet, such multiple sources are permitted for non - HFS data. More than 3 decades ago, Prof. Dommel adopted the simple and practical convention that current sources are assumed to be in parallel whereas voltage sources are assumed to be in series. I.e., signals add. Unfortunately, at the time your Editor did the HFS coding, neither he nor Gabor Furst seemed to foresee the practicality of more than a single source at any given node. Fortunately, a complaint came from Luciano Tonelli of CESI in Milano, Italy. In E-mail of the EEUG list server dated January 18th, he reported *"two small bugs of the HFS routine."* The 2nd involved ATPDraw, so is not of interest here. But the first was: *"If two or more harmonic current sources are connected to the same node, only the first is taken into account ..."* It is true that the resulting solution was wrong, and it was wrong to allow execution to continue. According to original design, there should have been an error stop. In fact, there was provision for a KILL = 12 error message in OVER8 below S.N. 5722, but this trap was inoperative, having been commented out. This easily could have been activated to cleanly reject the CESI data. But, thinking about the matter, your Editor decided that generalization would not hurt. Why force the user to combine parallel current sources when ATP is capable of doing the addition easily enough? To illustrate operation, a new 20th subcase has been added to DCNEW-21 (the former number 20 has become 21 in order to keep it last). Comment cards in E-mail of the EEUG list server the following day explain how data was copied from the 3rd subcase prior to the splitting of a source for two harmonics. About that KILL code, the one new restriction is this: For any particular harmonic, there must not be more sources at any one node than were defined for the power frequency. Fewer or the same number are allowed, but an extra source at any node, for any frequency, will trigger the new KILL = 242 error termination.

Batch-mode plotting of a Pisa-format .PL4 file generally was erroneous for the case of two or more output parts (more than just magnitude) prior to correction on January 31st. Rather than an error, an incomplete extension was involved. Recall how Pisa-format .PL4 files began. Massimo Ceraolo at the University of Pisa in Italy had advocated a file that was more suitable for concurrent plotting of his own separate interactive plotting program PlotXY for MS Windows, with the July, 2001, issue documenting improvement to include HFS intelligence. Your Editor never claimed support for such plotting by ATP itself for the multi-part (polar or rectangular or both) case, and no such illustration was planned as part of standard test cases. Curiously, that did not prevent an accidental and erroneous demonstration using the 19th subcase of DCNEW-19. The definition of NEWPL4 in data was involved. The reader will note that Pisa format is turned on at the start of the first subcase, and then turned off at the start of the 2nd. Since the first subcase involved magnitudes only, this was unaffected (plotting should have been normal). Note that the 15th subcase switches to Pisa format once again. But this time, there is no cancellation upon the completion of this anticipated use. So, following subcases including the 19th were creating Pisa-format .PL4 files by mistake. No problem for either printed HFS loop output or the .PL4 files themselves. However, the batch-mode plot of the 19th subcase was troubled. Polar output is involved, although only the magnitude of current BSA to ground is being plotted. Since a bar chart on the screen was involved, little indication of mishandling could be seen in the .LIS file. But if one looked closely, one line was wrong. It displayed bad summary statistics as follows :

```
 1) RMS value = 1.89736660E+02  2) THD = 2.236...
```

If data is extracted and established as a separate file, a normal C-like (not Pisa-format) .PL4 file will be used, and the .LIS file will show :

```
 1) RMS value = 2.62685998E+02  2) THD = 3.715...
```

Following the addition of code to ENTRY LU4BEG, these same values are seen in the 19th subcase of Salford DCN21.LIS Of course, Pisa-format .PL4 files are installation-dependent, so correction begins with Salford ATP which first revealed the error. The first observation, it turns out, was fortuitous. It occurred during unrelated experimental PARTIAL TABLE DUMPING and restoring of all test cases (negative TSTALL which defines positive ISTDMP). FC revealed the following difference line for the 19th subcase: `"??? A branch plot ... is not possible, since no such output exists. ..."` Your Editor has no idea why partial (but not Schultz's full) table transfers would have this effect, but he is not complaining. He was lucky to discover the unprotected and

unplanned usage --- seen many months earlier, but only now pursued. Curiously, the 18th subcase had similar structure, but revealed no such error at the time, although the RMS and THD values **did** change after the correction to LU4BEG. Yes, protection has been added for the remaining, unsupported deficiency : `"Halt ... There is no support for REPLOT if the .PL4 file is Pisa-format ..."` Correction of F95 Lahey ATP was verified the following day (F95 testing was ongoing). Correction of Mingw32 and Watcom ATP should be completed at the next translations thanks to modularization of the new universal code in BEGPL1. Since VAX / VMS ATP does not support Pisa-format .PL4 files at all, this version is being ignored for now.

Symmetrical Component Z0Z1Z2

MODEL Z0Z1Z2 introduces symmetrical component data as first mentioned in the July, 1997, issue. Yet, this original use involved compensation. Of more general interest is use with Type-51, 52, and 53 branches as described in the following (October, 1997) issue, and as illustrated within many subcases of DCNEW-23. Unfortunately, the inductive part of symmetrical component impedance data Zo or Z1 or Z2 was mishandled prior to a modification to IN5152 within UTPF segment SUBR3 on March 29th. Credit for the first recognition and complaint goes to Dr. Keith Walshe of Power Quality Technologies in Ultimo (greater Sydney), New South Wales, Australia. Orlando Hevia's message to BPA about the matter was dated March 4th, and it alludes to this: *"I was studying the problem presented by Keith Walshe."* Five days later, Mr. Hevia mentioned the apparent reason for Dr. Walshe's belief that there was trouble: *"Keith did a test with Z0Z1Z2 and the corresponding [R] and [L], as calculated with MathCad."* Answers did not agree, it would seem.

Many messages followed --- too many for your Editor or Dr. Tsu-huei Liu to comprehend. Mr. Hevia's changes then were taken along with others attached to E-mail dated March 7th. But your Editor did not understand either the theory or the effect on test cases. On March 9th, your Editor wrote: *"I ... found that one test case is different. This is the 12th subcase of DCN23. Reading the comment cards, variables that are supposed to be the same no longer are the same. ... I have not yet looked at details, but I am sure of one thing: I will not make the change in the UTPF until the effect on ... has been explained."*

Eventually, March 26th, Dr. Tsu-huei Liu found time to study code of the data conversion within IN5152. Her note to your Editor concluded: *"Summary of my finding. The formula Zab = Zo + a * Z1 + a^2 * Z2 is correct, but it is not correct to use inductance L in this calculation. You must use reactance wL"* (as part of Z0, Z1, Z2). Here "a" is the complex operator having unit magnitude and angle 120 degrees. Your Editor rapidly agreed with Dr. Liu's discovery. He corrected his error by multiplying by radian frequency OMEGA before the computation, and dividing by it after the computation. The only standard test case to have its simulation modified as a result was the 12th subcase of DCNEW-23 (DCN23l). Why not more of the 15? Well, some illustrations involved only resistance, so were immune. Others were balanced, conveniently using Zo = Z1 = Z2. For such data, there obviously is no error. More surprising is the immunity of subcases having Lo = 1.0 and L1 = L2 = 1/2. Are there any other good reasons not to use round numbers? This would seem to illustrate Murphy's Law of model verification!

If nonzero XOPT is in effect as Z0Z1Z2 data begins, there can be no ambiguity, the user is reassured. XOPT is the frequency of that data, so its use in the Zab formula is appropriate. But what if this is not the case? What if XOPT is zero as Z0Z1Z2 data begins? Note this could be either as a result of miscellaneous data near the beginning, or as a result of a later $UNITS definition. If XOPT is zero, there is need of a frequency to convert the sequence impedances from mHenries to ohms. Temporarily, your Editor has assumed that the power frequency is the appropriate frequency --- either as defined in STARTUP or later as defined by a POWER FREQUENCY (PF) declaration. But note the potential danger : the power frequency always is defined, but it varies from place to place (e.g., from one part of Japan to another). The user who relies on this definition as opposed to explicitly using $UNITS probably is pointing an unloaded gun at his foot. I.e., eventually a live round will find its way into the chamber, and the user will require crutches to walk. This is why a warning message has been added to each such use, to document the frequency: *"Symmetrical component data involves mH not ohms. Use power frequency STATFR = ... for the conversion."* For two users having different STATFR, this one difference line should be the first of many difference lines when .LIS files are compared.

Pocket Calc. Does TACS Supplemental

The TACS POCKET CALCULATOR (TPC) request was introduced in the July, 2001, issue. This allows the user to change from Dube's slow logic to the faster pocket calculator for supplemental variable evaluation within the dT loop. But what about cancellation, for use with a following stacked data subcase? Either ON or OFF can be appended to the original TPC declaration beginning February 1st. TPC ON is illustrated by DC-18 and TPC OFF by DC-20. Except for these isolated changes to interpolated input data, the .LIS files remain unchanged.

Branch Data Input Restructured

Extraneous $UNITS restoration was mentioned in the preceding issue. By ignoring `$UNITS, -1, -1` when

not preceded by a normal $UNITS definition, possible harm is prevented. Nonetheless, the source of the extraneous $UNITS restoration remained. In E-mail dated November 1st, Orlando Hevia pointed out that ACCESS MODULE BCTRAN might be a source. The 2nd subcase of his attached HBCTRAN.DAT did, indeed, punch an extraneous $UNITS restoration request at the end. Your Editor promised correction, and changes to BCTRAN were made the following day. The effect on standard test cases was the elimination of 4 extraneous restoration requests from DCNEW-8 output. Study revealed that the extraneous $UNITS creation could be created by code in any one of 3 locations, and each carried the identification "LEC" (indicating Leuven EMTP Center) on the left, and "GE" (the initials of LEC Manager Guido Empereur) on the right, as a comment. Code was simplified by elimination of 2 of the 3 identical copies using new variable MOON to distinguish among the three uses. The modification should be safe because it merely counts $UNITS requests using new variable KUNITS. It does not otherwise change execution. Then, at the end, when it is time for restoration, this now is inhibited if KUNITS is even.

Service of `$VINTAGE, -1` began November 4th following changes to 7 UTPF segments (DATOUT, BCTRAN, FXSOUR, OVER24, CIMAGE, NEWCBL, and SUBR25). Orlando Hevia had pointed out that an ending `$VINTAGE, 0` card was as great a potential problem as an ending `$UNITS 0, 0` was (see the April issue) --- for precisely the same reason. So, just as `$UNITS -1, -1` provided units restoration, so `$VINTAGE, -1` is being devised to provide vintage restoration. I.e., it will reverse or undo the effect of the preceding normal, old $VINTAGE declaration; and if there is no such preceding, old, normal $VINTAGE declaration, there will be a warning message, and the request will be ignored, in effect. For illustrations of both correct use and also improper use, see the 3rd and 1st subcases of DC-5, respectively.

USE OLD is the 3rd of 3 new restoration requests that are associated with branch data. It first was honored November 5th, when OVER3 was enhanced appropriately, and when an illustration of use was added to the 1st and 2nd subcases of DC-10. USE OLD will retract (i.e., will undo the effect of) the preceding USE RL or USE AR request. If there is none, there will be a warning, and the request will be ignored, in effect. Finally, there were those supporting programs that might punch a bounding USE RL to conclude punched cards. Only BCTRAN was found, and this was modified to punch USE OLD in place of USE RL .

HIGH ORDER PI CIRCUIT (HOPC) first was mentioned in the April, 1998, issue. The end of that story mentioned DC3HIGH.DAT but did not refer to any standard test case. Neither was HOPC located within any standard test case when a search was made November 22nd, your Editor was surprised to learn. So, the associated data HIGHPI.DAT was appended to DC-3 as a new 3rd subcase. Although not practical for real use, this initial illustration is being provided in FORMATTED form, which is simpler and universal (applicable to all ATP versions). The C-like alternative (the practical alternative) will be noted on a comment card. Note that [] can be used with HOPC just as with $INCLUDE (see the October issue) following an addition to IN5152 on November 23rd.

Cross - Sections of Cables and Lines

A picture of the cross-section of CABLE CONSTANTS (CC) or CABLE PARAMETERS (CP) data was mentioned in a paragraph of the October, 2001, issue. This had to do with work by Orlando Hevia of UTN in Santa Fe, Argentina. Subroutine KRPLOT (cross-section plot) provided access when new control KROSEC of STARTUP was positive. Although DIR DIB* was mentioned as a way of locating the original code, in fact author Hevia's code was added to UTPF segment OVER1 as a hidden feature. This was during July of 2001, when consideration in Portland was limited to verification of one or two cross-sections using the resulting GNU Mingw32 ATP. Why not using Salford EMTP, which is more convenient for development (due to its superior symbolic debugger)? Because author Hevia used DISLIN graphics to produce his picture, and no such software ever has been, or probably will be, purchased for use with the F77 Salford compiler.

Earlier this year, Mr. Hevia did more work (operation last year was imperfect), although your Editor remained unimpressed. In E-mail dated February 7th, he wrote: *"You are thinking of your particular plotting problem. I am thinking in general terms. Now, graphics use DISLIN. This is a problem if DISLIN is not available (e.g., for Salford EMTP). Rather than DISLIN graphics, we really want to use CALCOMP PLOT graphics where applicable. Some extensions would be required, since such code now has no provision for drawing and shading a circle. But this is a detail, just as the rectangle of a bar chart was not part of CALCOMP PLOT graphics."* Well, what might not have been understood last summer certainly was learned quickly enough this February. The 25th, Mr. Hevia wrote: *"I have now an acceptable plot of CABLE CONSTANTS and LINE CONSTANTS data. The screen plots and HP-GL plots are correct in all cable types. PostScript plots are correct for LINE CONSTANTS and for overhead lines of CABLE CONSTANTS, but cables and pipes are incorrect."* Later that same day, author Hevia added: *"I send krplot.f and other auxiliary subroutines ... circul.f : draws a circle using segments (call to plotxx)."* Yes, DISLIN graphics are gone. CalComp PLOTXX, NEWPXX, and AXISXX do all the work including the circles. A decade ago, one might object to the inefficiency. But modern PCs are so fast, it is expected that few users will notice much delay.

"Data card read in search for line/cable geometry" is the new interpretation for data cards as they are read by Orlando Hevia's code to produce the plot of the line/cable cross-section. Some thought has been given to the elimination of such output when KRPLOT is used as an extension for the line/cable-related supporting programs (when KRPLOT = 1). But until there is a lot of experience with other data, it seems safest to provide an indication of the data being read when trouble begins.

PostScript (PS) output should have been a free fringe benefit of the conversion to CalComp graphics. But there was an unexpected complication that Dr. Tsu-huei Liu documented in E-mail dated March 7th: *"I looked into the problems with PS output for DC-27 and DC-28. The trouble is in PSAXIS. The GhostScript viewer complained about 'undefined' coordinate labeling, such as 'x-1061'. After I added a space before the minus sign ..., all of the drawings in DC27.PS and DC28.PS appear fine. Apparently Bob Meredith in New York, who coded the original PostScript logic for ATP, did not provide enough space for the numbers of your pictures. ... We can change I5 to I6 in that FORMAT statement in PSAXIS."* The change was made in two places, but it is conditional. The extra space is used if and only if it is needed. As a result, all previous output, including PS output of standard test cases, remains unchanged. Again, continuity is important.

Juan Martinez Stresses PCVP loop

Faster computers and bigger tables are needed. This was explained in E-mail from Prof. Martinez dated January 21st: *"1) In the end, we would like to simulate distribution networks with about 150 three-phase nodes. But this is not possible with our current computer unless we decided to wait for no less than 3 days. So we have decided to stop at one half of that size (60-70 nodes), reduce the simulation time, and buy the fastest personal computer (2 GHz). And even then, we will need several hours."* In his reply two days later, your Editor recalled *"Glenn Wrate, who was the first guy to report trouble passing midnight twice with Watcom ATP. Your summary is even more dramatic, despite improved computer speed in the interim."* How improved? The July, 1996, issue contains a summary, and that was about half a year after your Editor's 133-MHz Pentium was nearly top-of-the-line. No question, several hours at 2000 MHz is a lot of computation. Why so much? *"2) We have developed a new load model. ... We calculate in a random way ... As a consequence of all these 'complications' we could simulate networks with only* ***two loads****. The model is so complex that only 2 nodes were accepted. After some refinements, we have been able to run cases with 10-12 nodes, which is not so bad."*

About bigger tables, Prof. Martinez stated that he needs 1000 $PARAMETER blocks, 5000 $PARAMETER variables, *"4 times the current size of LTACST (it is now 120K), and 3 times the current size of LSIZ23 (it is now 350K)."* Hidden in these numbers is a a problem, as your Editor explained on January 23rd: *"In MATDAT I see* `CHARACTER*15000 CHSYMB` *--- a line that carries the explanation 'enough storage for 1K symbols of 15 bytes each.' This looks like trouble, if we now need 5K instead of 1K. A factor of 5 here would be 75K which probably will be rejected by the compilers. The Salford limit might be 32K, as I recall. So, it looks like the time finally has come to reprogram this storage."*

Storage within MATDAT was converted from two CHARACTER*15000 scalars to CHARACTER*1 vectors. This was for CHSYMB and CHNUMB, to avoid the two byte indexing limit of various compilers as mentioned in the preceding issue. Many locations were affected. Work was done in-line to ensure maximum execution speed rather than minimum file size (non-comment source code has expanded by 42 lines). Whether speed has been helped or harmed, your Editor does not know. This detail will be left for Prof. Martinez and his students to measure --- users who have industrial-strength $PARAMETER data. Your Editor simply made the changes, and first tested them on January 26th using Salford. Amazingly, all $PARAMETER test cases (8, 58, 59, N2, N19, N21, N25, and N26) agreed exactly on the very first try. So the work was adopted for use with all compilers.

An interesting summary of the presentation of his IEEE paper (see the January issue) was mentioned by Prof. Juan Martinez in E-mail dated February 6th : *"... the most amazing reaction was that nobody cared when I said that we might require several days to simulate realistic-size distribution networks. Somehow, the message was 'OK, go ahead!'. OK, we'll go ahead, but after adding some new features. For instance, during the next few days we'll try to use/run two computers in parallel by means of the Internet. One will run the case, the other should read and manipulate the information produced by the ATP. I hope this will reduce the simulation time ..."*

Partial Table Dumping (PTD)

TSTALL of STARTUP has been selected for the definition of ISTDMP in order to save file space by the avoidance of another variable. Normally, TSTALL will have value zero, of course. If positive, it is a time in seconds (the original meaning, which has been retained). If negative, the absolute value is assumed to be the fraction of ending time Tmax at which the test of table dumping will be performed. E.g., value -0.5 will result in the test being performed half way through the simulation (at about time Tmax / 2) . Note that there is no need to change data (an important detail) . One can verify table dumping and restoring for many data cases without changing any of them. Yes, this was done for the family of all standard test cases DC*.DAT using RUN.BAT On the other hand, if the

user does want to bury his request for testing in a specific data file, $DEPOSIT can be applied to either TSTALL or ISTDMP as illustrated by the 2nd and 3rd subcases of DC-7. Note cancellation at the top of the 4th subcase, as explained on comment cards.

Decks RTURBO, WTURBO, and LTURBO have been produced by translators since the beginning of the Schultz Revolution as mentioned in the January, 1994, issue. Well, a 4th deck named ZTURBO has been added to support the just-described experimental table dumping. Specifically, the Z indicates zero, and there will exist one line for each COMMON block of LABCOM (currently, there are 109 of them). Most involve CALLs to either MOVE0 (for integers) or MOVER0 (for floating point). For exceptional A6 storage, COPYA applied to TRASH is used. Finally, for Dube's CHARACTER*1 CSTO of List 15, an in-line DO loop will deposit the decimal digit 1 everywhere. A final peculiarity is this: dimensioned limits are used in ZTURBO just as they always have been in RTURBO and WTURBO. Of course, for Schultz's table dumping, this is required (for a thorough test, whatever is to be dumped and restored also should be erased). But this is an enormous case of overkill for PTD use. The storage of each C0B COMMON block will be entirely erased even though only part of it, or none of it, was dumped (and will be restored). For the erasure, the *partial* of PTD is ignored. All declared storage of LABCOM will be erased, so there should be no possibility for error. The only weakness is due to limitation of the erasure to the C0Bxxx COMMON blocks of LABCOM. Not included is other storage such as the COMMON within BLKCOM or SYNMAC, which are handled by TABLES rather than TAPSAV. Also not tested or trapped is local storage. The pocket calculator provides the best example. Yes, interface VOLTI is properly handled, and this includes some storage (e.g., for constants). But there also is local storage within POCKET. If execution ever stops, this local storage will be lost; and it will not be there to support START AGAIN resumption at a later time.

The ISTDMP test of table dumping and restoring will not be allowed if data involves STATISTICS, SYSTEMATIC , MEMSAV = 1, or START AGAIN. The user may request the test via negative TSTALL (the request is not illegal), but ATP should ignore any such request. The philosophy is this: since data already involves real table dumping, restoring, or both, why add an artificial test to the existing real one? To be continued.

Miscellaneous Intel PC Information

What is a standard BPA PC these days? The following was written by Dr. Tsu-huei Liu to several nearby BPA engineers on January 24th : *"Your PC is due to be replaced by a new one (BPA's 3-year PC replacement plan) next month. The current configuration of a BPA-standard PC is: 1 GHz CPU, 256 MBytes RAM, and 20 GBytes of hard disk. Do you want your PC replaced by a BPA standard PC? If not, please tell me what configuration ..."*

"Moore's Law is the observation made in 1965 by ... Intel co-founder Gordon Moore that the number of transistors on a chip -- and so, approximately, the chip's computing power -- would continue to double roughly every 18 months. But while Moore's Law proved to be a remarkably accurate engineering forecast for three and a half decades, it is now apparent that chip speeds are doubling even more frequently than every 18 months." This is one paragraph in the middle of a *New York Times* story dated February 4th. By John Markoff, this writing is entitled *"The increase in chip speed is accelerating, not slowing."* Yes, and equally important, prices have dropped. Both the price / performance ratio and the price itself are being driven rapidly toward zero (the only obvious lower bound). Today, the greatest expense of a PC is a large monitor. These, too, are cheaper, but the improvement is nothing like that of the system unit (including disks) .

Miscellaneous Small Items

ATP Analyzer by BPA last was mentioned in the January issue. On the 23rd of that month, Jules Esztergalyos wrote: *"Thank you for the *.exe. The 'PL4 comments' feature works. I can bring up the PL4 comments on the new Analyzer. I will send Laszlo the latest Analyzer version 3.01. It is much faster and has more features."* Watcom ATP was involved, as explained in a separate story.

Generator shaft fatigue (shaft loss-of-life estimation) seems to be yet another ATP computation for which data now is unavailable, generally. Recall that the mention of SHAFT and Richard Rose in the October, 1996, issue included no such ominous information. Yet, data availability always seems to go from bad to worse. Murphy's Law of ATP data: *"anything that can be sold will be sold."* In E-mail dated October 23rd, Bill Mittelstadt of BPA's Network Planning branch reported to management as follows: *"I talked to Baj Agrawal of APS this morning about combustion turbine torsional studies. ... The shaft mechanical model that he obtained from the manufacturers is used in this study along with a simplified model of the network. In some cases he is checking for SSR also when series compensation is involved. His experience is that the manufacturers will not provide loss of life characteristics, i.e. number of torque peaks versus loss of life curve. Accordingly, Baj sends the manufacturer his simulation study results and asks if any loss of life is expected. This suggests that we could follow the same process if one person were assigned to set up and run EMTP studies ..."* Of course, APS indicates Arizona Public Service in Phoenix. In the southwest, shaft fatigue has been a dominant subject of interest for more than a quarter of a century (since the Mohave SSR

accident during the early '70s). Yet, at the time, BPA never performed such studies. Generation belonged to others (if federal, to the U.S. Army Corps of Engineers), so BPA was not responsible. Suddenly, this has changed. Suddenly BPA asked many other parties to propose additions of new generation (for wind, see the July, 2001, issue), and BPA is responsible for certification that integrity of the grid will not be adversely affected by each proposed addition, it would seem.

FLZERO was added to JMARTI SETUP on October 12th in order to make sure the final decade included the final point. Comment cards of the 4th subcase of DCNEW-6 document a phenomenon that first was noted by BPA's Dr. Tsu-huei Liu using that unusual data from Dr. Siqueira de Lima of ONS in Brazil (see the January issue). The objection might be only aesthetic; it might have nothing to do with validity of the associated fitting. But it is noted now because this might not be the only place in the computation requiring change. Understanding followed remembrance of Laurent Dube's treatment of times within MODELS a decade or more ago. Roundoff error was the problem, since current simulation time always is computed from the preceding simulation time by adding dT : T = T + DELTAT. Everywhere, Dube was forced to add or subtract a near-zero number. He would accept the start or end of something (e.g., a source function) if T was close to the scheduled time. The user should prefer this near-zero error to a dT-sized error. Well, the JMARTI code increments frequency rather than time, but the concept is the same. The user who requests a frequency scan of 8 decades beginning with 1.E-3 deserves to see the final point at 1.E5 Hz .

Wind power is **not** economically competitive, even in windy locations. This is the conclusion your Editor draws from an October 27th story of *The Seattle Times*, which begins: *"A tax credit designed to promote wind power expires this year ..."* How big is the federal subsidy to owners? *"The credit grants a 1.7 cent per kilowatt hour tax credit for new wind-power facilities for the first 10 years of a plant's operations. ... [BPA] officials say that several current developments, as well as its program to buy into 1,000 megawatts of new wind-power projects, would be jeopardized."* Recall BPA's grand plans for wind generation were summarized in the July, 2001, issue.

Parameter KOMPAR allows the user to reduce the precision of the phasor branch flows and injections for easier comparison as mentioned in the October, 1998, issue. Yet, operation was not demonstrated by any standard test case prior to December 5th when a new 6th subcase was added to DC-5. Comment cards explain details.

$DUMMY defines the root name (3 characters) and starting serialization (typically unity) for dummy nodes that are created by $INCLUDE as illustrated by DC-64. This first was mentioned in the October, 1998, issue. A second mention can be found exactly 3 years later, and it was the change associated with this most recent mention that seemed responsible for loss of automatic internal initialization. The comment in DC64.DAT mentions default initialization, but this could not be located on December 13th when your Editor investigated a complaint by Orlando Hevia of UTN in Santa Fe, Argentina. Mr. Hevia's E-mail the preceding day had included a 1-line correction to OVER1. About symptoms of trouble, Mr. Hevia reported: *"it was a problem for a user in Brazil: ... the names were DU,000 ..."* where the 3rd character of the root name should have been M rather than a comma. This seems to have been using a GNU version of ATP since no trace of the problem was noted at BPA using Salford EMTP on DC-64 after removal of the $DUMMY card. Note that any other garbage character might go unnoticed, but a comma is potentially deadly because it typically is used as the separator character for free-format numbers.

"Relay testers to read .PL4 files" was the title of a story in the July, 1998, newsletter. Omicron Electronics in Altach, Austria, first had proposed reading ATP .PL4 files directly, and file specifications were disclosed to Omicron for this purpose (and only for this purpose). Three and a half years later, Doble Engineering in Watertown, Massachusetts, USA, expressed comparable interest on behalf of its own ProTesT software. This was explained in semi-public E-mail of the EEUG list server dated December 17th, which explained a requirement that previously had not been stated: *"Restriction to a single person is the added restriction that was not mentioned in the 1998 writing. Since then, security has been tightened in several ways, and this is the latest: only one person is provided with .PL4 file specs, and he is not to share them with anyone else. In the case of Doble, the initial inquiries came from persons in Florida and Mexico. Yet, coding would be done at the factory in suburban Boston, Mass. So, the proposal is to release ATP .PL4 file specifications, PUGET.LIS, just to this one person in Watertown"* who *"has been encouraged to submit his own ATP license application soon."*

Names DBGTYP, BINTYP, and EXTTYP were added to STARTUP on December 21st in order to allow user redefinition of the .dbg, .bin, and .ext file types. Changes to UTPF segments BLKCOM, SYSDEP, and RSTART were required. Due to clever design, no change of STARTUP actually is required (assuming the user is willing to continue to use the old default names). Due to lack of space (line 20 now is full), -BLANK was removed, and now is being defined internally.

THERE GOES THE NEIGHBORHOOD was a new request that entered the UTPF February 15th in order to handle many connected switches. Prof. Karen Butler's students at Texas A&M University in College Station continue to stress ATP in unusual ways. Recall Adeoti Adediran was mentioned in the July … To be continued.