Can / Am EMTP News

Voice of the Canadian / American EMTP User Group

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Salford FORTRAN Compilers

Laurent Dube's 3 C-language illustrations of user-supplied source code for MODELS were activated November 17th. A separate story mentions how the original 1995 code was located in E-mail archives following independent creative work by Orlando Hevia using the GNU compiler. Well, Dube's code was Salford C, so the first order of business at BPA was installation of this compiler (it had been purchased along with the FORTRAN, but was not being used) . The 13th and the 14th of November, Dr. Tsu-huei Liu and your Editor struggled with installation. First, Dr. Liu installed C without difficulty. But the following morning, your Editor found that the FORTRAN compiler then did not work. By trial and error (repeated installation of both compilers), two important details were learned. First, DBOS must be installed in \DBOS.DIR (the default directory name). When instead it was placed in \SALFORD (your Editor's choice back in 1999 when the FORTRAN compiler was installed), C compilation would fail to locate system include files *.h Second, FORTRAN must be installed first, and C second, because the DBOS of C is more general (it adds *.h files). If the order is reversed, the *.h files will exist following installation of C but will be removed during subsequent installation of FORTRAN (amazing; what a pain). But finally, both compilers seemed operational at the same time. Then, without difficulty, object files for Dube's 3 C-language disk files were created. But the linker refused to extract the required externals until Dr. Liu discovered (her note indicates: *"on 486, just hit Ctrl-Alt-H to get online help for FTN77 and C"*) the all-important qualifier /ANSI_C for C-language compilation. For example :

```
SCC  /ANSI_C  CFUN.C
```

Following this addition, Dube's previously-unsatisfied externals became satisfied, and his 3 missing test cases were activated at the bottom of DCNEW-28 without difficulty.

Size of executable Salford EMTP was noted November 21st. At home, using version 2.66 software without any C compiler, your Editor noted :

```
TPBIG  EXE   3,795,536   11-21-01   9:40p
TPOLD  EXE   3,291,840   12-09-97  10:28p
```

Note the substantial growth (15 %) over the past 4 years. Yet, this is an underestimate because it ignores the C-language code from Noda and Dube. At BPA, using version 3.51 software that includes the C compiler, omission of the Noda and Dube subroutines saves just over 42 Kbytes (an additional 1+ %) .

Fortran 95 from Lahey Computer

F95 Lahey compilation was pursued most of the 3 final days of the year, leading to an executable TPBIG the following day. Changes over the past year and a half resulted in many isolated conflicts and two general and serious problems with aliasing (=>) as the F95 alternative to F77 EQUIVALENCE : 1) the pocket calculator as used to support TACS supplemental variables (the POCKET / TACSUP interface); and 2) Orlando Hevia's new supporting programs --- most importantly, LOSSYS to support LOSSY SATURATION as illustrated by DC-13. The final LOSSYS trouble was not resolved until the 4th day of the New Year. It took a full 7 days to confirm the first 20 standard test cases!

The original .TMP file is connected by installation-dependent RFUNL1 as execution begins. Curiously, there was a warning message about the debug file being in use. This was an old problem that previously had escaped notice. RANDOM_NUMBER of the Lahey library was being used to generate a random file name without previous use of RANDOM_SEED. In fact, the random number was fixed. So, the usual seeding (this is done for all other compilers) was added January 1st, leading to a different .TMP name each time. Provided the user supplies a .LIS file name after DISK or BOTH, no .TMP file should remain upon the completion of execution. But if neither DISK nor BOTH is used, a file (the name will consist of 8 random numbers) will remain. As a result, occasional deletion is advised to avoid excessive accumulation.

SPYPRM remains installation-dependent. However, it was updated to the universal module except for the addition of "1X," in two places to prevent the loss of column 1 of the opening prompt ("EMTP begins …"). This is to account for the old carriage control character of printers from decades ago. The Lahey screen continues to honor this just as the DEC VAX / VMS screen did.

New UTPF segment HEIDLR posed the biggest challenge, primarily due to zero subscripting in LOSSYS. More precisely, for days zero subscripting was **thought** to be the problem; and a lot of work was performed to remove it. But some garbage numbers remained after all subscripts had been made positive, so it is unclear how much of the problem they represented. Zero subscripting came in two classes. First, there were some explicitly-declared cells numbered zero. These were easy using F77, although they did result in EQUIVALENCEs to cell 2 of existing vectors of ATP tables. It was these EQUIVALENCEs that your Editor was unable to convert to F95 aliasing, so code was modified to use only positive subscripts. This was the **expected** zero subscripting -- the explicit problem, which disappeared January 2nd. Trickier (only discovered later) was **unexpected** zero subscripting -- the implicit problem. For F77, typically this would occupy the last cell of a preceding COMMON block, and such a cell most likely would not be used, so trouble never was observed. But with F95, the COMMON disappears. So does understanding (your Editor knows nothing about how Lahey F95 data structures occupy memory). So the removal of subscripts beyond declared vector dimensions seemed prudent. Unfortunately, this did **not** result in correct answers. Surprisingly, overflow of List 2 storage for those 1024 steps (see DC-13) was discovered. For F77, there was no problem because List 2 used during linking always was 3000 or larger as declared in LISTSIZE.BPA . But for F95, it is numbers in the .DAT file that determine array sizes, and 3 times default dimensioning produced only 900 cells --- fewer than the 1024 required. Unfortunately, execution did not die, although some bad numbers (several strings of stars) were an unmistakable sign of trouble prior to the addition of protection on January 4th.

LU6VRT allows the user to size his output buffer, and value 256 was being used when testing began. Frankly, your Editor can not remember why such an intermediate value (neither zero nor much larger, such as the traditional 32K) was being used. But it worked, so who cared? Well, it failed for DC-17, for some reason. Why or how this might have changed is not known, but results certainly were unreadable using either EDIT or LIST. Eventually, your Editor realized that the correct, readable output was being sent to default name OUTPUT.LIS because flushing was required prior to the prompt for the output file name. Why this was not seen 2 years ago is not known. Anyway, using more buffering (2048) solved this problem, and LU6VRT then was increased to 32768 without difficulty. This followed corresponding change to Lahey TFLUS1 in which the limit 65000 will be found. Your Editor tried 65536 = 2 * 32768 , of course, but a compiler error resulted.

Larger size of Lahey F95 TPBIG was mentioned in the January, 2000, issue where the Lahey F95 story began. Your Editor clearly is not alone in observing this disadvantage of the newer (F95) software. A colored (black and red ink) paper copy of the Lahey newsletter dated *"fall 2001"* was received in the mail around the end of the year, and this addresses the issue of executable file size. A column entitled *"Q & A"* (question and answer)

occupies the entire page 6, and text begins with the question: *"Why are LF95 Windows executables larger than LF90 executables?"* The Lahey answer follows : *"LF90 programs depend on system DLLs or DOS interrupts to accomplish many runtime tasks, which means a much smaller executable."* Your Editor is not impressed. This looks like yet another good reason to continue to use DOS. Part of the secret of Salford EMTP and TPPLOT success is reliance upon Salford DBOS --- a DOS extender that runs under DOS. Relying on DLLs, Salford DBOS was part of the solution, not the problem.

News from Outside USA and Canada

Hawala is the name of the semi-legal or illegal system of money transfer that seems equivalent to the Western Union (WU) service that was mentioned in the January, 1998, issue. That writing four years ago used the word *ancient* in reference to WU. But after reading about hawala, WU is modern. For those who have not read the increased news about money laundering following the September 11th bombing of the former World Trade Center in New York City, hawala is believed to have been the banking system used by the terrorists. Whereas WU keeps records, and is subject to surveillance by taxing authorities and police (just as any bank would be), hawala is secret and is largely impenetrable to police --- particularly after the fact. A good summary can be found in a *New York Times* story by Douglas Frantz. Dated October 2nd, and filed from Quetta, Pakistan, this story has title *"Ancient secret system moves money globally."* In theory or intended appearance, the purpose is innocent: *"He said transfers were usually sent among family members and involved a few hundred dollars. ... He provides a five-digit code word, a letter and four numbers, that the recipient takes to one of Mr. Khan's associates as far away as the United States, Germany or Russia. The same associates accept money for transfer to relatives in Quetta."* Of course, there are records at the time of transfer, but they vanish upon completion: *"They tell the code word, and we hand over the money ... Then we tear up the records on both ends."* So much for theory and appearance. There also is reality: *"The system is used for far larger sums, often by drug traffickers, corrupt politicians and black market traders, according to local experts and law enforcement."* Speed of modern-day hawala rivals that of WU: *"The transaction can occur in the time it takes to make a couple of phone calls or send a fax."* About the long history: *"The system was in place long before Western banking. The ancient Chinese used a similar method called 'flying money,' or fei qian. Arab traders used it as a means of avoiding robbery along the Silk Road."* The unasked as well as unanswered questions are these: How is value actually transferred geographically? Is this where wholesale laundering of money and corruption of politicians is involved? Rather than an **alternative to** conventional international banking, is it possible that modern-day hawala has become an **extension of** conventional international banking ?

Iran last was mentioned in the July, 2001, issue. Perhaps modern ATP is available in that country in spite of obstacles to export (policy of the American government that followed takeover of its embassy in Tehran during 1979). October 21st, your Editor received E-mail from a Yahoo mailbox that is used by a student at Tehran University. In response to your Editor's inquiry about age of the ATP version being used, Hosseini Saeed explained: *"I have one of last versions of EMTP / ATP software, and it's very graphical. I don't need any branch cards because these are generated automatically. ... I am comparing the results obtained from EMTDC, EMTP, and MATLAB6."* Your Editor had mentioned the punching of branch cards by CABLE CONSTANTS or CABLE PARAMETERS --- lines that then would be inserted in the file of ATP data. Presumably the automatic generation is a reference to ATPDraw, or perhaps Prof. Hans Hoidalen's supporting program LCC (see the July, 1997, issue) .

More about the Internet and E-mail

Pornography always has been a successful business on the Internet, but few have given this semi-legal industry credit for technical innovation. *The Register* did this in a story entitled *"Porn VirtuaGirl is the best Net innovation we've seen for a year."* This story, posted July 3rd, explained: *"It's no secret that the porn industry has come up with hundreds of innovations in Internet technology -- because its customers want things faster, better, simpler ..."* About VirtuaGirl (said to be a nude dancer): *"We're talking small files but high-quality rendering and movement ... The software itself is seamless, easy to use, instinctive and so on. How do we know? Because we signed up for a three-day period for $2.95. All in the course of serious investigative journalism of course."*

Further growth of E-mail is the subject of a story posted at *The Register* on September 20th. Entitled *"Email churn surges into the tens of billions,"* this summarizes a study by unidentified IDC, which claims *"that email volumes are going to soar to staggering levels over the next few years ... The number of email mailboxes is predicted to top more than 1.2 billion by 2005, up from 505 million in 2000."* Rather than the solution to difficulties with communication, this seems to be a growing problem: too much and too easy communication, particularly from unwanted contributors. Obviously, no one knows how spam will grow since nobody can foresee the effectiveness of future anti-spam laws.

Domain bpa.gov is a black hole for E-mail, it would seem. This is yet another of the surprising discoveries of Dr. Michael Steurer of CAPS at Florida State University in Tallahassee. A separate paragraph about snubber circuits of hvdc mentions *"E-mail to Dan Goldsworthy dated October 15th."* Well, Dr. Steurer inadvertently omitted the "s" of Goldsworthy's name, as your Editor noted in the copy

that he received. Finally, on October 23rd, your Editor mentioned this error to Dr. Steurer at the same time he communicated a copy of the writing about snubbers. Of course, your Editor assumed that Dr. Steurer already realized his error, since his message should have bounced from the bad address. But this was not the case. As Dr. Steurer responded the following day: *"Strange but true, email to dlgoldworthy@bpa.gov do* ***not*** *bounce back to me. ... In order to probe a little deeper, I copied this message to an obviously strange (and hopefully non-existent) email address at bpa: mischaxzy@bpa.gov ..."* At first, your Editor assumed that *Mischa* was a familiar form for *Michael* in Switzerland, just as *Mike* would be a common American *nickname*. But on February 14th, Dr. Steurer provided a more complex explanation. It seems the name Mischa *"was created by my grandmother in Austria (where I was born), rather than in Switzerland (where I only stayed for 3 years finishing my PhD)."* Continuing with the story, on October 26th, Dr. Steurer related an independent experiment by a resident expert: *"One of our computer specialists … has just confirmed this to me as follows: 'Apparently the BPA mail servers are configured to accept all messages for delivery. I tried sending messages in debug mode to several bogus addresses and the BPA server returned <Recipient ok> for every one.' So the problem is really on your end, and the current setup is indeed not very user-friendly, is it?"* Your Editor agrees, and can not imagine any legitimate reason for the practice. Certainly security should not be the justification since employee names and Internet addresses have been available for years via the BPA Web page. Once connected to www.bpa.gov one clicks on *"How to Contact Us"* within the *"Help and Info"* menu at the left. Finally, click on *"Telephones and E-mail"* to reach a search form. This was used October 28th to demonstrate that BPA listed no *Goldworthy*. The search ended with a rejection message (in red): *"no staff records meet criteria."* Next, the missing "s" was added, and "Daniel L." was located as expected.

"Court says France can't censor Yahoo site" is the title of a November 9th story found at the Web site of *The New York Times*. This is round 2 of what looks like a long legal fight that is international in scope. Recall round 1 was lost by Yahoo in a French court, as reported in the April, 2001, issue. Now, in a California court, under different law and in front of a different judge, Yahoo has prevailed: *"A federal judge ruled on Wednesday that the United States Constitution's protections of free speech trumped a French order requiring Yahoo ... to remove Nazi materials from its Web site."* But the French plaintiffs have promised an appeal, so final resolution might require years.

Govnet is the informal name that has been given to a proposed secure alternative to the Internet --- an alternative that would be used only by the U.S. government and trusted friends. This news comes from a November 17th story found at *The New York Times* Web site. Of course, the Internet was begun by the U.S. Department of Defense in order to provide more reliable and secure communication (see the January, 1999, issue). But in those early years, New York still had a World Trade Center. Following the bombing on September 11th, more than just airplane security has been examined closely. Due to easy accessibility to anyone located anywhere in the world, the Internet fails the security test. About Govnet, *"the idea ... is the brainchild of Richard A. Clarke, a counter terrorism expert whom President Bush recently named his special adviser for cyberspace security. ... Mr. Clarke used a multicolored flowchart to describe a government communications system that would have its own routers, keeping it segregated from other computer users. He envisions a system that would be strictly monitored and constantly scanned for viruses. ... The administration has asked the industry to submit information by next week about how such a system might work and what it would cost."*

European EMTP User Group (EEUG)

13 years of Can/Am newsletters are available as a single archive from EEUG storage on the Internet. In list server mail dated November 29th, Deputy Chairman Laszlo Prikler first announced availability of the January issue *"on the EEUG web site http://www.eeug.org. Click on the 'EMTP News' link and download from all issues of Sept. '88 - Oct. '01 as a single file [all_in_1.zip (5 MB)] ..."*

"Secure EEUG Web pages are unavailable now" was the *"Subject:"* of E-mail of the EEUG list server. Dated December 21st, this warning by Deputy Chairman Laszlo Prikler explained: *"For a while (2 weeks?) the secure part of the EEUG Web site does seem inaccessible. ... During the first week of unavailability, I got many complaints in private, so I put a memo on the server ... Anyone can see it following the authentication. The reason for the problem is not clear. The server is up, and authentication is completed normally ... If one logs into the top of the Web site (www.eeug.org or www.emtp.org) all is OK. If one logs into the free directory under the /files e.g. http:// www.eeug.org / files / free an error message appears in German. ... The German error message refers to insufficient user rights to perform the operation. I do not recall any modification that could result in such a message. My guess is that our ISP upgraded the Web server software and made a configuration error. What was working in the past (and still is working with many other Web servers around the globe), did not work for a while at our host."* Resolution was not delayed long. December 25th, EEUG Chairman Mustafa Kizilcay provided this good news: *"The secure Web site ... was temporarily not available because of precautions taken by the service provider. Now, it is accessible using unchanged passwords ..."*

News About TACS and MODELS

ERRSTP is Laurent Dube's error termination routine for MODELS as was explained in the January issue.

DCNEW-28 certainly demonstrates correct operation (see the first 10 subcases), although data is rather simple, and the unusual CONCATENATE INCLUDE FILES is involved. Yet, trouble with a MODELS error stop was reported by Prof. Mustafa Kizilcay of FH Osnabrueck in Germany. His E-mail dated December 6th mentioned *"abnormal .LIS output in case a NEW LIST SIZES request is included in a data case. Such peculiarity occurs in case of an input data error. I am sending you attached BUG_LIS.ZIP that contains ... heviz_mk3n1.lis ... The output header appears five times! The bottom is garbage. ... heviz_mk3n1.dbg is a very huge file."* Yes, an error was found and corrected in ERRSTP three days later. Local variable LL80 was being used as the length of an output line, but had never been defined. As a consequence, results were unpredictable.

A TACS tutorial by Tom Field was mentioned in the October, 2000, issue. Recall Mr. Field is with Southern Company Services (SCS) in Birmingham, Alabama. Well, December 31st, the following good news was received in E-mail: *"I was going through a review of work for the year and saw where the free TACS tutorial had been released and sent to ... and a few others, but not put on the list server. I have attached the TACS tutorial from a course I taught a year or so ago that should be put on one of the password protected list servers. This was initially released to licensed ATP users in the beginning of February 2001."* Your Editor was very slow responding. Finally, amid apologies and explanation, your Editor wrote the following on January 24th: *"This is the easiest way to share it with other ATP-licensed users: contribute it to secure EEUG and JAUG storage on the Internet. Yet, the Can/Am user group does not maintain, or have direct access to, any Internet storage. If it has something that it wants to share with other licensed users, it sends a copy to either Prof. Prikler (EEUG) or Dr. Funaki (JAUG). Every 3 months, I do this with a new PDF copy of the newsletter."* Mr. Field had mentioned that *"there is no FREEP website at this time,"* to which your Editor responded: *"I am sure you are plenty busy with other things. We all are. It is amazing how time passes. The great FREEP debate was in 1997. It will be 5 years this spring."*

Line and Cable Constants

"Blank card ends stacked subcases of cable data" is the new interpretation of a blank card that ends a subcase of CABLE CONSTANTS (CC) or CABLE PARAMETERS (CP) data. This began October 26th, to remove confusion regarding optional simultaneous CC and CP declarations. Previously, CC had one interpretation and CP had another. Now both interpretations are the same. While treatment still is not perfect, it has been improved substantially. For example, as comment cards within the 4th subcase of DCNEW-6 (the data from Brazil) explain, the CC declaration now is optional. Previously, it was required for the JMARTI use. No longer. This was the original desired change: to make CC optional within JMARTI data just as it is when JMARTI is not involved. This succeeded, although the number of blank terminators remains fixed at one. Curiously, other standard test cases changed by more than just the anticipated words of interpretation for the single terminating blank card. Solutions to DC-27, 28, DCNEW-6 and 29 all were affected. Surprisingly, the last of these involved the addition of 16 lines of interpretation as mentioned at the start of this paragraph. The data was not changed, but the solution was --- by the addition of one interpreted data line per subcase. Previously, the data was being used, but was not being recorded in the output file. That no one ever complained about this lack is a little surprising, but it would seem that one seldom looks closely at successful execution.

Shunt conductance can be defined by the user as part of CP data as mentioned in the July, 2000, issue. November 27th, details of this possible definition were changed following the recommendation of the author, Prof. Akihiro Ametani of Doshisha University in Kyoto, Japan. Fortunately, no change to the user's data is involved. Quoting from Prof. Ametani's letter to Drs. Mustafa Kizilcay (FH Osnabrueck in Germany) and Tsu-huei Liu (BPA) dated November 21st: *"Responding to Mustafa's request about the distributed admittance model (IYG option) of CABLE PARAMETERS (CP), I have been investigating Mustafa's data (a PT cable with a core semiconducting layer) using the IYG option ... the IYG option assumes that data of the distributed admittance ... are to be given for both the core and the sheath of an SC cable, because the admittance matrix becomes numerically singular if only the core admittance is input. To avoid the singularity, the IYG option regards the case of only the core admittance being input as an SC cable with only a core. Thus, the distributed admittance appears only at the (1, 1) element corresponding to the core self element in Mustafa's case in which the input data was only for the core. ... The trouble is solved by adding an artificial admittance for the sheath. The additional sheath admittance is to be far smaller than the original core admittance ... The main routine of CP has been modified so that an artificial admittance is added if only the core (or sheath) admittance is input for an SC cable having a core and a sheath. The modification is ..."* Only UTPF segment NEWCBL required modification. To illustrate the changes, three new subcases (numbered 16 through 18) were added to DCNEW-29 by Dr. Liu. The solution to no other disk file DC*.DAT was modified.

Brain - Damaged MS Windows

"There is good news about EDIT ..." This was the tentative, hurried assessment of Win 2K that can be found in the October, 2001, issue. While true, access to the Win

95 editor did not last long. There was another problem with the OS change: loss of the original DOS font. Fortunately, August 21st, Dr. Tsu-huei Liu was able to restore the old familiar 25 x 80 MS-DOS font. This was considered the top priority: returning DOS to the way it was designed to look. More than just proportion and absolute size were involved, it should be mentioned. Mike Albert's freeware FC had become practically unusable (its scrolling seemed to depend on the standard DOS proportions), and this was your Editor's greatest objection). Well, Dr. Liu succeeded in restoring the original DOS font, and for some days your Editor was ignorantly blissful, believing that we were enjoying the best of possible MS Windows worlds. But eventually your Editor tried to EDIT a large file, and access was denied. Then he tried to edit 2 files, and this, too, was rejected. In short, the font restoration had been accompanied by restoration of the crippled EDIT command of NT. If any Windows 2000 expert knows how to avoid this compromise, his advice would be appreciated.

Software libre was summarized in the January issue, which mentioned that "*libre is the French word for free*." As part of his pre-publication review, Spanish-speaking Orlando Hevia in Argentina observed the following on November 9th: *"And Spanish, too."* When your Editor inquired about Portuguese, the language of Brazil (where the movement began), Mr. Hevia responded: *"I think the Portuguese word is livre. I do not have a Portuguese dictionary at home."* Curiously, *livre* means *book* in French. In different places, the Latin evolved differently.

RECLOSE Option of a Breaker

The RECLOSE enhancement of time-controlled, Type-zero switches became effective December 24th as illustrated by a new 6th subcase of DC-55. Whereas a conventional time-controlled switch allows only a single T-close and a single T-open, the RECLOSE option extends this to an arbitrary number of such time pairs.

Inspiration for the RECLOSE option came from Orlando Hevia of UTN in Santa Fe, Argentina. In E-mail dated December 21st, he had concluded: *"With more times to close/open a switch, we will have a powerful feature to model the reclosing of protective devices, if they can be simulated with time controlled switches."* Mr. Hevia had noted that Hermann Dommel's MicroTran allowed multiple switch times, and he had wondered why ATP did not.

In his initial reply two days later, your Editor was skeptical: *"Interesting. This is a very old idea that has not been much in demand during recent years. I am a little surprised to learn of implementation by Dommel. Let's see, for EMTP, what were the counter arguments? 1) With TACS, the user can program his own switch logic that goes beyond the conventional time-controlled switch. Two or more closing and opening times would be just one of many possible extensions. By now (25 years later), does Dommel offer TACS? If not, this might be one reason for his generalization of the time-controlled switch. 2) With MODELS, one has even more flexibility than with TACS, if this is required. 3) Ignoring control system modeling, it is possible to parallel two or more time-controlled switches. This would be since 1982, when switch logic was generalized. Of course, MicroTran had no such logic. Once again, was this a reason for Dommel to generalize his time-controlled switch logic?"*

About Microtran, later that same day Mr. Hevia explained that his knowledge came from *"The manual. Microtran's free demo (limited to 19 buses) comes with a PDF manual."* Upon reading this, your Editor observed: *"From time to time, I mention a crippled version of a program that might be used for advertising. 19 busses gives new meaning to the term crippled! Even limited to real MS-DOS (the 640-Kbyte barrier), Lahey ATP offered 250 nodes during the mid-to-late '80s, as I recall. Initially, we were using default List 1 ..."* As Mr. Hevia seemed to be losing hope of acceptance (*"It is my idea, but that does not prove that the idea is a good one"*), your Editor was warming to the possibility (*"It is not a bad idea. I am still thinking about it."*). That was December 23rd. A day later, implementation was complete.

The RECLOSE feature was added because it was so simple -- once logistics had been studied and understood. As your Editor summarized for Mr. Hevia on December 24th: *"Only two subroutines (OVER4 and OVER16) are affected, no new storage is declared, and each subroutine has new code in just one place. Implementation really was simple, once I figured out what to do. As you say, a new, useful tool at low cost."* No new storage was required because existing List 10 vectors were used --- one cell per extra T-close and T-open pair.

LOSSY SATURATION by Hevia

LOSSY SATURATION was briefly mentioned in the preceding issue. Since that writing nearly a year ago, author Orlando Hevia has documented nicely the theory and use in *EEUG News*, the newsletter/journal of the European user group. According to Editor Laszlo Prikler, *"Inductor with losses in the ATP"* can be found on pages 13-22 of the August, 2001, issue. This concludes (Section 6) with a striking illustration of the difference in the exciting current of a grounded-wye connection compared with that of a delta connection --- data that has been appended as new 3rd and 4th subcases of DCNEW-7. Graphs and bar charts clearly show that line current of the former includes all odd harmonics whereas line current of the latter is missing the so-called *triplen* harmonics (numbers 3, 9, 15, etc.). As rationale for Orlando Hevia's ATP extension, consider his *"Introduction"* (remainder of this story) :

"The SATURATION option of ATP produces flux-current output (in peak values) from voltage-current input (measured RMS values). The measured current is assumed to be purely reactive. That is, the inductor is assumed to have no losses, so the resistive component of current can be ignored. This is reasonable as a first approximation.

Also, SATURATION may be troubled by a lack of homopolar (i.e., zero-sequence) components of the measurements. SATURATION assumes that the inductor has been measured as a single-phase device. But this generally is not true if inductors are part of a 3-phase bank that is delta-connected. While the delta connection can be accounted for, the line current --- what, in fact, is measured, typically --- will lack harmonics with numbers that are odd multiples of 3 (i.e., 3, 9, 15, etc.). In some instances, the difference can be considerable. Inductors connected in star (wye) with ungrounded neutral are comparably complicated. These currents, too, will lack homopolar components.

LOSSY SATURATION is a new option of ATP that accounts for losses as well as the connection of the three inductors. Losses can be represented by a non-linear resistance in parallel with a non-linear inductor. This is not the same as an inductor with hysteresis, it must be emphasized. Hysteresis is ***not*** *being considered in the present analysis."*

Corrections to This Newsletter

SAVE ALL was mentioned in the July, 2001, newsletter. Ever since last summer, your Editor has intended to investigate the following observation by BPA's Dr. Tsu-huei Liu, which was recorded in E-mail dated June 12th: *"When I looked into DCN26.DAT, I saw that SAVE ALL had been commented out in the 4th subcase of DCNEW-26."* True, although your Editor still has not yet investigated why.

Schweitzer in Pullman, Washington, was imprecisely identified a decade ago. Recent newsletter issues use the plural (laboratories) whereas the April, 1992, and October, 1993, issues wrongly used the singular (laboratory). As verified by connection to **www.selinc.com** on October 26th, the name is Schweitzer Engineering Laboratories.

New EEUG List Server

MSN Hotmail adds an involuntary advertising line at the bottom of messages that it sends free of charge. For example, see mention in the October, 2000, issue. That was the general belief, anyway, until moderator Laszlo Prikler made an important observation on October 6th. Jian Jiang of Clemson University in South Carolina had submitted two messages from his Hotmail address, and only one of them was burdened with the advertising line. To the sender and moderators, Prof. Prikler requested : *"Please share with us how to control this. It would be a great help for Hotmail.com mailbox users and would reduce moderators' effort significantly."* Later that same day, all subscribers received an explanation from Jian Jiang using the same Hotmail address, but without any advertising line: *"I set up an HTML e-mail account in Outlook Express. The first e-mail was sent from there. But the second e-mail was sent from the MSN web site. I guess this is the reason for the ad message. After I received your request, I did a test, which proved my guess was right. You can avoid the ad message by sending e-mail from your own e-mail software rather than logging in to the Hotmail web site."*

Unpredictable *"Date_of_request:"* was mentioned in the October issue, where 3 distinctly different forms were illustrated. Yet, each entry shown contained all desired information in some form. November 1st, a stranger date was received from Prof. Lionel Orama of the University of Puerto Rico in Mayaguez. There is no indication of either day or month; there are just the 4 digits "2001" .

Really unpredictable *"Date_of_request:"* was noted in the Web-form E-mail by Patrick Wells of Siemens Westinghouse in Cincinnati, Ohio. Received at BPA on *"Friday, November 02, 2001 2:54 PM"* (the *"Sent:"* date and time) at least the first line agrees with this date: *"Form submission date and time: November 2, 2001 at 23:53:54"* But the 2nd line reads: *"Date_of_request: 2001.11.05"* For the record, Cincinnati should be 3 hours ahead of Portland.

Multiple copies of E-mail from the Web form represent yet another unforeseen complication. The Web form instructs the user to click his mouse on the *"Send"* button after all licensing information has been entered. Implied is a **single** click. That is all that is required --- one set of information, and one click of the mouse button. But what if a user clicks 4 times? Or, what happens if the user fills out the form 4 times, and clicks on it each time? This seems to be what happened October 17th, when 4 comparable messages were received from a student in Van Nuys, California.

Monte Carlo (STATISTICS)

A STATISTICS or SYSTEMATIC data case without a STATISTICS or SYSTEMATIC switch card will be prevented by a new KILL = 241 error termination. This change to OVER4 was made October 31st following study of that huge data case from Wuhan, China (see preceding issue) . This was a STATISTICS data case because miscellaneous data parameter NENERG was positive. Yet, no switch carried the request word STATISTICS in columns 55-64. Your Editor and BPA's Dr. Tsu-huei Liu noted with amazement that the loop over energizations was

traversed even though there would be no difference between one simulation and another (because each had the same switching times). The repeated simulation was wasted effort that henceforth will be prohibited.

Optimally Encoded Output

Consistency of the optimal encoding of floating-point numbers was improved December 1st by work on FLTOPT. Numerical values have not changed, but the appearance of some formatted output has. Specifically, it is normalization that is affected. As an illustration, consider the specific difference that prompted the reform. GNU solutions to standard test cases were being compared with Watcom solutions, and differences such as the following, produced by DCNEW-28, were noted :

```
Compare files:
 \gnunt\models.1  1587  11-29-101   6:47p
 \watnt\models.1  1587  11-26-101  11:31p
Changed lines 46-47
 > 10** -7.        :  1.E-7
 > 10** -6.        :  1.E-6
To
 > 10** -7.        :  .1E-6
 > 10** -6.        :  .1E-5
```

Why the differences? At first, your Editor thought that differences of roundoff error between GNU and Watcom were the cause. But looking within the Salford output of WRITE1.DAT (one of Dube's 78 test cases), your Editor noted lines 2 and 3 of MODELS.1 as follows :

```
    10** -8.        :  .1E-7
    10** -7.        :  1.E-7
```

This lack of consistency within the ATP output that is produced by a single compiler is even more troubling than differences involving two different compilers; and it prompted the improvement of FLTOPT.

ATP Licensing Problems

Your Editor's response to Erich Gunther of Electrotek Concepts continues (see preceding issue for beginning) .

So Electrotek employees are *"trying to make a living, keeping our families fed and have a good time doing it,"* eh? Well, of course. Who could fault such reasonable goals? If one must choose between eating and not eating, who would prefer the latter? The same goes for having fun at work. It must have been fun spending that EPRI money to convert EMTP to run under OS/2. For an account of this debacle, readers are referred to stories beginning with the one entitled *"EPRI EMTP using OS / 2 is slow"* in the January, 1991, issue. The following issue mentions *"Quarter-speed DCG / EPRI EMTP using OS / 2,"* which is the title of a 3-page exposé by your Editor in the March, 1991, issue of LEC's *EMTP News*. Of course, after EPRI learned how badly the Electrotek product performed, work might not have remained as enjoyable as it was initially. The bottom line is this: feeding one's family and having fun are not accepted as excuses for the violation of signed and legally-binding contracts. In exchange for the free use of ATP, Electrotek had agreed not to participate in EMTP commerce. But it violated this written agreement as already noted in the October, 1996, summary. If Electrotek has a problem today, it need only look in a mirror to see the cause.

Mention of EPRI, ABB, and DCG raises the possibility of ATP forgiveness. Recall the first ATP pardon was granted more than a decade ago, as explained in the January, 1992, and July, 1995, issues. This was for G.E. in Schenectady (see the July, 1991, issue). Later there was CEPEL in Brazil (see the July, 1999, issue). Both organizations had been involved in EMTP commerce with EPRI and DCG, but subsequently were licensed to use ATP free of charge in exchange for declarations of intentions to cease EMTP commerce. Such offers of ATP forgiveness are **not** a right (see the January, 1992, issue), but they remain open today for EPRI and DCG members. So, an alert reader might be wondering: why not a possible pardon for Electrotek, too? While your Editor does not definitively and irrevocably oppose the possibility, there are several problems.

A possible ATP pardon for Electrotek would involve several problems, readers should understand. First, there has been a complete lack of interest thus far, from what the user group knows. Obviously, a pardon would never be formally considered in the absence of a serious expression of interest. Second, there is the issue of organizational importance, as first stated in the October, 1990, issue. Note that the 1990 LEC meeting in Leuven, Belgium, was informed about *"an important DCG / EPRI contractor such as General Electric ..."* Well, if Electrotek now describes itself as *"simply a small consulting firm,"* it might fail the test of significance to the power industry. Third and finally, Electrotek was licensed to use ATP at the time it signed a contract to work on EMTP for EPRI, yet it did not promptly notify the user group of its change of loyalty (and simultaneous loss of free license to use ATP). This is a fundamental difference. Neither G.E. in Schenectady nor CEPEL in Rio de Janeiro had been ATP-licensed prior to its EMTP commerce. Electrotek **had** been. Electrotek already has had one chance. The situation of G.E. in Schenectady was quite different. It probably began its EMTP commerce before it knew anything about ATP; and CEPEL seemed to be trying hard to convey such an impression of ignorance in its own public explanation (see the July, 1999, issue). This is quite unlike Electrotek, which signed an ATP *affirmation of non-participation in EMTP commerce.* Electrotek was unmistakably informed of the consequences of EMTP commerce (i.e., loss of ATP materials) prior to making its decision to engage in EMTP commerce. Electrotek already has violated the written ATP licensing agreement once. How or why should it be trusted to honor any second licensing agreement? Does Electrotek deserve a second ATP chance?

Nova Scotia Power Corporation was the employer of Doug Mader, the long-time, former DCG Chairman whose name can be found in many previous issues. As documentation of the adjective *former*, your Editor will summarize communication with another NS Power employee, Stephen Boutilier, who had inquired about availability of the ATP Rule Book. Since the inquiry came from an **nspower.ca** address, your ever-vigilant Editor speculated about company name, and mentioned a problem with free ATP licensing because of Mr. Mader's activity on behalf of DCG. September 17th, the response was: *"I do work for Nova Scotia Power! Doug Mader, the current and long-term chair of DCG EPRI does not. He is currently employed with ENTERGY and located in the USA. Perhaps you were unaware of this change."* In his reply the following day, your Editor explained: *"I think we might have learned this two years ago. ... Note that it [Mader's departure] affects nothing in terms of free ATP licensing, assuming the company paid for Mader's air line tickets, hotel rooms, and time (while conducting DCG business around the world). This would be considered both significant (many thousands of dollars and months of time) and voluntary. The company would seem to have engaged in EMTP commerce (past tense) whether or not Mader has left since then. That is why the standard, free licensing agreement could not be used. Instead, if the company really were ready to end its EMTP commerce, an ATP pardon would be required. The first of these was granted to G.E. in Schenectady as reported in the July, 1991, newsletter. More recently (a year or two ago?), one was granted to CEPEL in Rio de Janeiro, Brazil. Both organizations once were active DCG collaborators or contractors, but now use ATP instead of DCG/EPRI EMTP."* For details about CEPEL, see a story in the July, 1999, issue. About company names, **www.nspower.ca** leads to a nicely-organized Web page. Clicking on the FOR INVESTORS button then reveals: *"We were NS Power Holdings (NSH), now we're Emera (EMA) ... To learn more about Emera ... visit www.emera.com ... Emera's business interests now extend beyond Nova Scotia."* Indeed they do. Included is apparent control of an American utility. Multinational utilities seem to be alive and well in Canada as well as the USA : *"Emera announced it will acquire all of the common shares of Bangor Hydro-Electric Company, a regulated electric transmission and distribution business operating in Maine."*

GNU ATP Installation Dependence

VAST/f90 for Linux provides an interesting extension to g77 (the FORTRAN 77-compliant GNU compiler). The VAST/f90 compiler comes from Pacific-Sierra Research Corporation (PSR) in Santa Monica, California, which uses Web site www.psrv.com This first was explained to your Editor in E-mail dated 8 February 2001 from Orlando Hevia of UTN in Santa Fe, Argentina: *"I was testing the VAST f90 compiler (Linux). The program is really an f90 to f77 converter, plus a library to take into account the f90. It uses the g77 compiler. The personal version I downloaded is free, but I cannot send binaries to other persons, and it has some restrictions. The professional version is complete and the binaries can be sent to other persons. The cost is $250. ... I want to test with DISLIN calls (I must learn f90 first!) ... I don't know the differences between f90 and the newer f95, but to study, the free version of VAST f90 is a good tool. I send some document files ..."*

"Is djgpp for masochists?" This was a question in the October issue. Perhaps your Editor was being excessively negative, in passing this djgpp humor along to readers. In E-mail dated August 20th, Orlando Hevia reported some good news on the subject: *"The newer version of the djgpp compiler has some corrections. Some of the strange aborts produced by the old version are non-existent now."*

Comment cards were eliminated from the INCLUDE files *.INS that are produced by the VAX translator as mentioned in the October issue. This was part of the story about VAX ATP. While it represented progress for the VAX and Mingw32 compilers, it seems to have caused trouble for at least one alternative GNU flavor. This was explained in E-mail dated September 26th from Orlando Hevia of UTN in Santa Fe, Argentina. Some INCLUDE files are not used, and without comments, so they ended up as empty files. Mr. Hevia had written: *"the 0 bytes long xxx.ins files are easily deleted by error (particularly in DOS DJGPP) . I am replacing by a dummy file, with non-zero bytes length."* The following day, your Editor and Dr. Tsu-huei Liu noted 6 empty files in the \GNUNT directory : 3 (COMTA2, FLTOP1, and FORMLA) were universal and 3 (MOVEC1, MOVEC2, and POCKE3) were installation-dependent. Each was augmented by an extraneous CONTINUE statement in order to avoid future problems. This represents a return to common practice a decade or two ago.

The previously-mentioned debugging of DC-22a and DCNEW-19a finally began on September 29th. Vector KOMAND was found to be a problem. It uses the storage of NONLE, which was not being saved for data that involved Type-10 sources. Unfortunately, before correct operation could be verified for all test cases, the unit-52 problem (see mention elsewhere in this issue) was encountered, so verification was delayed several days.

Comings and Goings

"ComEd has donated their DPSS (Digital Power System Simulator) to Valparaiso University. I have some SEL relays and a SEL AMS box to drive them. SEL is donating the software to drive the AMS box but the input MUST be COMTRADE format." This was the interesting

beginning of a September 6th inquiry from Al Kraft of Valparaiso University (believed to be in Indiana). ComEd is believed to be Commonwealth Edison in Chicago, Illinois. Although not named at the time, ComEd was the company from which Tom Field once wrote intelligently about real-time simulation (see the January, 2000, issue). In response, your Editor replied as follows later that same day: *"Tom Field ... moved to Southern Company Services in Birmingham ahead of recent restructuring in Chicago. I view your writing as possibly an indication of the end of what once seemed to be ambitious involvement with digital simulation at ComEd."*

Steve Ashmore, previously employed by Hatch in both Canada and Texas, and later by ABB, is now back in Montreal, Quebec, as the self-employed head of QVARx Inc. Contact goes back a long time. The first form letter about general ATP availability was mailed by the user group on 6 December 1987, whereas a copy was mailed to Mr. Ashmore 7 days later. This according to mailing records in CANAM.LIS Next, your Editor encountered Mr. Ahmore at Prof. Dennis Carroll's first EMTP short course in Florida. This was in the spring of 1989, prior to availability of Salford EMTP --- when Lahey ATP was being executed within the 640 Kbytes of real MS-DOS. A connection to Gabor Furst was not previously known. Yet, on Janury 11th, Mr. Ashmore wrote: *"Great to see his name on the ATP website. Actually, Gabor was my first boss. I was fortunate to have had the chance to learn under him ..."* About current location and interest in ATP: *"Ste-Anne-de-Bellevue is on the western tip of the island of Montreal. We specialize in studies of VAR / harmonic correction, and manufacture the equipment. We use ATP mostly for switching studies of capacitors and filters."* BPA would seem to have interest, since the northern end of the West Coast hvdc intertie is at BPA's Celilo substation near The Dalles, Oregon, and conversion results in harmonic pollution. Celilo is on the Columbia River, of course, where there is a big dam named John Day. Offering a visit some time, Mr. Ashmore wrote: *"I frequently travel out to The Dalles ..."* Several days later, Mr. Ashmore added: *"Enjoyed ATP collaboration with Bill Roettger from the 1989 course (does anyone know Bill's email address?) and James Wikston at Hatch ..."* Both names can be found in newsletters (most recently, in the December, 1989, and January, 2000, issues, respectively) .

Power Company Politics and Religion

"EPRI tries new funding approach" was the title of a short paragraph in the November 5th issue of *Hot Issues*, which is BPA's internal Web publication. This provides independent confirmation of EPRI's financial problem as mentioned in the October, 1998, issue. There supposedly exists *"a new venture ... called the 'Electricity Innovations Institute.' The institute will seek public funding for power-related research projects. EPRI traditionally has relied on funding from member utilities for its research and development work. As competition has replaced cooperation among utilities, industry-wide support of EPRI's research has become more problematic."* True, EPRI began with funding from member utilities. That was the original concept. But after a few years, EPRI wanted more money, so it tried to become commercial. Do not forget the $50K or more that EPRI had demanded for EMTP licensing of one company (see the January, 1992, issue). However, commerce seemed unsuccessful for EPRI --- particularly PSPO commerce in electrical software. Next came restructuring of the electric power industry. Without a profit-ensuring monopoly, members no longer were willing to pay as much for EPRI services. So now EPRI is looking to government for preservation? Taxpayers are warned to hang on to their wallets more firmly than ever.

Enron, the world's largest energy trader, was bankrupt on the first business day of December. Implications for the American power industry might be substantial as explained in a story found at the Web site of *The New York Times.* Dated December 3rd, this has title *"Collapse of Enron may reshape the battlefield of deregulation."* According to the authors, *"some of Enron's longstanding opponents -- chief among them the Southern Company of Atlanta, which owns many local power monopolies -- see a fresh chance to slow deregulation, or even roll it back."* Congressional leaders *"are vowing to get to the bottom of one of the most precipitous business reversals in history. And some members of Congress say Enron's downfall, on the heels of California's energy meltdown early this year, proves that Washington must demand more disclosure from energy traders, holding them at least to the standards of Wall Street firms."* But *"the Bush administration, along with some Democrats ... continue to favor plans advanced by Enron that would pry open regional electricity markets."* How big was Enron's empire? *"At one point up to half all electricity and natural gas transactions passed through Enron's trading operation, by some estimates."* Lack of disclosure was a major problem: *"With its exemption from scrutiny in hand, Enron revealed relatively little about its trading portfolio, leaving analysts guessing how it had made its profits."* The role of huge accounting firms also appears suspect. *"After Enron, new doubts about auditors"* is the title of a *Washington Post* story dated December 5th. This began with a summary: *"On Sunday, six weeks after Enron disclosed that federal regulators were examining its finances, the global energy-trading powerhouse became the biggest bankruptcy in U.S. history."* About the defective accounting: *"Like all publicly traded companies in the United States, Enron had an independent auditor review its annual financial results. In this case, blue-chip accounting firm Arthur Andersen had vouched for the numbers."* But those numbers were in error. By the time Enron later had corrected them, investor confidence had been lost, and a death spiral had begun. Another hot air balloon of Wall Street deflated rapidly. About the numbers, how could respected accountants fail to provide advance warning? Where is there a conflict? *"Major accounting firms often*

make more money from selling clients advice than they do from auditing their books. The accounting firms help businesses pick computer systems, lobby for tax breaks, even evaluate takeover targets. ... Auditors frequently leave their watchdog positions for jobs at the companies they audit. This career path can encourage auditors to make improper compromises, the SEC has warned." Of course, SEC indicates the Securites and Exchange Commission, which oversees American stock trading. The article mentions a *"basic, underlying conflict: The auditors are hired, fired and paid by the companies they are responsible for auditing."* One viewer is quoted as saying: *"Too often, they operate under the principle that the customer is always right ... They will give the answer that the customer wants ... so they can continue to get the fees."* Possible criminal consequences became official during early January. *"Enron is target of criminal probe"* is the title of a story found at the Web site of *The Washington Post*. Dated January 10th, this begins: *"Justice Department officials confirmed yesterday that they have begun a criminal investigation of Enron Corp. Sources said the probe is focusing on whether the company defrauded investors by deliberately concealing crucial information about its finances."*

Pocket Calculator Used by PCVP

Any function of -VAR1 * VAR2 or -VAR1 / VAR2 was mishandled prior to a correction to POCKET on December 3rd. The first report of trouble came from Orlando Hevia of UTN in Santa Fe, Argentina. Attached to his E-mail dated November 30th was ATP data file EXP.DAT (*"I send a problem with Type-10 source"*), and this served as the basis for the addition of variables GAS4 through GAS9 to the 4th subcase of DCNEW-19 --- the comprehensive test that now illustrates 69 uses. Prior to correction, Mr. Hevia's data resulted in a local error stop that was explained as follows: *"Halt above 1328. Missing 2nd half of IF-ELSE."* Of course, IF-THEN was not being used at all. Rather, the leading minus sign inside the open parenthesis of any function was being mishandled when followed by the structures shown (multiplication or division). Actually, Mr. Hevia used a constant rather than a variable for VAR2, but this is a detail; **both** cases are illustrated in the added examples. The correction is particularly satisfying because changes are confined to a single location (the error stop). As a result, the new code does not slow execution of other cases, and it can not possibly change answers that previously were correct.

"The pocket calculator refused to process a formula such as ..." This is the way a paragraph began in the October, 2000, issue. Now the story can be repeated, but with a different contributor and a different formula. This time, it was Prof. Juan Martinez of UPC in Barcelona, Spain, who discovered the problem, which he reported in E-mail dated January 8th. As a verbal summary, he explained that these were *"results from a parametric study of overhead line parameters."* The troubled formula within his LINE_A.DAT disk file was : `OUTERCO1 = 28.0 - 25.0 - ( KNT - 1.0 )` This was for LINE CONSTANTS within a PCVP loop, with the formula appearing in a $PARAMETER block in order to vary the horizontal location of a conductor. The pocket calculator will evaluate the parentheses first (call this value C). Apparently this was the first use of instruction A-B-C, *"as unlikely as this might seem"* (same words as two years ago). So, another modification of the five POCKE* UTPF segments was made, plus TACSUP (supplemental variables now can be evaluated using the pocket calculator). This was January 9th. To be sure the operation continues to work, variable GAS10 was added to the 4th subcase of DCNEW-19 later that same day.

Vector Plots of JMARTI Fitting

The curve fitting of JMARTI SETUP finally can be evaluated using color graphics of the screen rather than monochrome printer plots of the .LIS file. After more than 11 years of vector graphic disuse (Apollo at BPA was lost during the summer of 1990), the high-resolution display of JMARTI fitting became available once again during early December. Of course, today nearly everyone uses a color monitor. This is important because the theoretical (LINE CONSTANTS) and the fitted (transfer function) curves usually agree very closely. Without color, it would be difficult if not impossible to separate the two curves.

An illustration was planned for this location based on HP-GL output of the screen plot. A month or two ago, BPA's Dr. Tsu-huei Liu had demonstrated to your Editor that HP-GL output of ATP could be taken into WP 9 and then exported to MS Word using MS Word format (an output option of WP 9). But a complication has been realized at the last minute: VECPLT is not the same as batch-mode plotting. So the illustration is being delayed 3 months. Final word as this issue is being closed for publication at the end of February: the problem of JMarti HP-GL has been solved, but space no longer remains.

The new vector plot of fitting produces one new line of LUNIT6 output for each JMARTI fitting, so two new lines for each coupled phase, in general. For example, the first subcase of DCNEW-5 is augmented by the following immediately after the printer plot of Zo fitting for mode 1 :

```
 Ok,  use  [ -2., 7.0 ] (equiv. "TIME" values).
```

Within square brackets will be seen the base-10 logarithm of frequency. In this case, the frequency scan was from .01 Hz through 10 MHz --- 9 decades in all.

The user does not request that SPY produce the new JMARTI plotting. A decade and a half ago (using those great Apollo windows), SPY was run explicitly for such plotting. But this no longer is true, for either Mingw32

ATP or Salford EMTP. In effect, the more modern and more primitive implementations use CALCOMP PLOT rather than SPY PLOT for the graphics. JMPLOT is the new binary switch that remembers such use. Unlike normal batch-mode plotting, however, there is no individual request for any particular plot. Instead, plots are produced automatically, with two for each mode of JMARTI fitting. Furthermore, ATP data need not change in any way. The plotting is either suppressed or performed for each mode depending on controls of the execution. For GNU Mingw32 ATP, NODISK = 1 (see the July, 1999, issue) will suppress such plotting during RUNTP DISK execution. For Salford EMTP, NOCALC = -1 will produce the plot during RUNTP DISK execution as illustrated by DCNEW-5. The addition of $DEPOSIT does not affect Mingw32 ATP, but it is necessary for Salford EMTP to produce the screen plots during the verification of standard test cases. In fact, NOCALC = -1 predates the NODISK switch (see mention in the October, 1994, issue), although it now is being used in a slightly different way than originally. There was no need to add NODISK to Salford GRAPHICS.AUX because negative NOCALC already was available in Salford graphics code.

The quotation marks around JMARTI SETUP have been removed from the titles of all plots. This was a concession to the existing proportions of Salford plots. The critical information --- either Zo or A1 --- followed the two fixed words just mentioned. But because the Salford font was so large, the leading Z or A was being clipped at the right edge of the screen. Shortening by two characters (the quotation marks), either Zo or A1 now is fully visible without any change of font.

Diagnostic printout of LINE CONSTANTS was inadvertently being turned on for the 2nd subcase of DCNEW-5. Output file DCN5.LIS suddenly (following activation of the new plotting) included 3 or 4 extra lines documenting the transformation matrix -- output produced by LCMODE) . After about 2 hours of struggle, this was traced to an old, old (mid-'80s) EQUIVALENCE that communicated INDEXL between 2 subroutines. The EQUIVALENCE was modified in order to eliminate the extraneous output (a small amount for the .LIS file and a larger amount for the .DBG file) .

Program changes were not great, but they were tricky; and considerable experimentation was required using both Mingw32 and Salford ATP versions. Seven UTPF segments required modification --- REQUES, REQUE5, MAIN23, TIMVAL, FTPLOT, PL4REC, and BEGPLT --- with the 2nd and 7th of these being installation-dependent (i.e., Mingw32 modules, too, required modification). Work was performed by trial and error during the 4 days of December 8th through the 11th. No changes were required for Watcom ATP, however, because no screen graphics are being used with Watcom ATP.

Publishing Programs and Viewers

DIN A4 paper has been mentioned several times without explanation in previous newsletters. Orlando Hevia clarified the name in E-mail dated August 20th: *"Do you know what the A4 is? The 4 is the exponent of 2**(-4) = 0.0625 which is the area in m**2 of your A4 paper. ... The x / y ratio of A-series paper is SQRT (2). From this, you can calculate x and y and you will obtain x = 0.297 m and y = 0.210 m (rounded values)."* The guy must be a walking encyclopedia (impressive, some of the trivia he can relate).

"About alleged incompatibility of WP 9 with HP-GL, Laszlo Prikler reported success ..." Thus began a short paragraph in the April, 2001, issue. To complete the story, Dr. Tsu-huei Liu was able to apply this advice at the time, although details were slightly different at BPA. Instead of *"Insert | Graphics | From File menu"* she found *"Graphics | Image | Name | Insert"* (where *Name* is the name of the disk file). But the graphics did look normal except for slight clipping on the right (the right-edge grid line was missing).

Hoidalen Improves ATPDRAW

An impressive endorsement of ATPDraw was received in E-mail dated October 17th. This was from respected and long-time ATP user Francisco Javier Penaloza Sanchez of CFE LAPEM Delegación Centro Occidente in Morelia, Michoacán, Mexico. In response to your Editor's explanation that program developers at BPA do not use ATPDraw, the following was written: *"By the way, I have to say that in the first years ATPDraw was available, I was not convinced of its goodness due to its earlier limitations and errors. But beginning with version 2.1, it began to fulfill better my expectations of a graphical interface to ATP, and currently 90% of my work is done through it. Despite sporadic bugs, these are the main advantages I detect: 1) faster cycle in the solution of transients; 2) better documentation of studies; and 3) easier introduction to ATP for new users. Of course, no graphical interface program can -- will ? -- provide access to 100% of the ATP functions, but for the typical transient cases, ATPDraw is a very good aid."* In reply the following day, your Editor agreed about the pictures : *"I certainly understand about point 2. Tsu-huei and I were talking about this some weeks ago. The picture has value --- particularly later, after one has forgotten details of what has been assembled."*

Time-step size DELTAT would seem to be yet another problem of the *Hoidalen Revolution* (see the July, 2001, issue). Once again, Prof. Laszlo Prikler in Budapest was involved. He is the one who answered the following inquiry that was made via the EEUG list server on November 29th: *"I'm using ... ATPDraw to run a simple series RC (R =*

0.002 ohm; C = 595015 pF) circuit fed by a dc supply. I got the current through the resistance having oscillations of high frequency ..." Later that same day, Prof. Prikler explained: *"Great, so you have a system with ~1 ns time constant. I reply to you with a question: What was deltaT of your simulation? Your case is running fine for me with deltaT = 1.E-10 and Tmax = 5.E-9. No oscillation is seen in the current. But if you use ATPDraw's default deltaT = 1 us time step, you will have some problems ... GIGO."* Privately, your Editor observed: *"This seems to be another aspect of the Hoidalen Revolution. Not only does ATPDraw allow the user to ignore columns, it also allows the user to ignore dT? Amazing. As you write, GIGO. But the worst part is this: some of these modern users do not even recognize what has happened. This guy in Scarborough did realize something was wrong, but he seemed to have no idea what."* Prof. Prikler had the final private word, and it included an excellent suggestion for the ATPDraw author, Prof. Hans Hoidalen in Trondheim, Norway: *"Maybe it would be better to change the default setting to dT = 0. This way, even mentally-handicapped users will recognize that something is wrong with dT of their data, and not with ATP. ... If dT = 0, a KILL = 2 error message is the result ..."* Yes, such a change should solve this particular problem. But your Editor suspects that there must be many other comparable ones. Fundamentally, the problem is this: many ATPDraw users seem ignorant of various important details of ATP data. More than just knowledge of the appropriate columns for data is involved, unfortunately.

Creative ATP Modeling

Are snubber circuits of BPA hvdc simulation real as opposed to artificial? This was the surprising question posed by Dr. Michael Steurer of CAPS at Florida State University in Tallahassee. At the time of the great debate about tapezoidal rule oscillation (see a year of newsletters between mid-1995 and 1996), no one ever questioned the parameter values of snubber circuits that were being used successfully either at BPA or by Dr. Kurt Fehrle (who traced his hvdc experience to many years of work at General Electric). In 1996, the question was: should the user be forced to add snubber circuits? The question was not: are the parameter values of snubber circuits artificial? In E-mail to Dr. Steurer on October 8th, your Editor had writtten: *"BPA had no trouble simulating the West Coast hvdc intertie some 15 years ago. There are two ends (although probably 3 terminals were studied by planners), two poles, each with 4 stacked bridges of 6 or 7 valves or thyristors. No problem, according to Goldsworthy. If you want data, it has been widely distributed as mentioned in the July, 1992, newsletter (see hvdc.zip)."* In E-mail to Dan Goldsworthy dated October 15th, Dr. Steurer questioned parameter values of the snubbers, and he mentioned that your Editor *"also referred to your work when I asked about the issue of 'artificially big' or 'fictitious' snubbers needed for power electronics in ATP (this and similar statements can be found in papers ... As far as he recalled, you did* ***not*** *need to use 'fictitious' snubbers to model power electronics in EMTP-ATP. Did you?"*

Fuzzy logic never before has been mentioned in newsletters, although the name can be found in E-mail archives AGORA*.LIS between 1994 and 1997. August 14th, there was an inquiry about fuzzy logic from Mohd. Hasan Ali, a doctoral student at Kitami Institute of Technology in Japan. *"Power system stabilization by fuzzy logic controlled braking resistor using EMTP"* was said to be the research area. Your Editor responded with more questions than answers, and received the following clarification later that same day: *"Up to now, I used TACS for fuzzy logic. But I used trial and error method to determine the membership functions and control rules of fuzzy logic. Now, I am interested to apply Genetic algorithm technique to determine those fuzzy parameters optimally. In the Genetic algorithm technique, iteration (looping) is needed. Therefore, I must use MODELS instead of TACS. Already I have made statements / expressions using MODELS for fuzzy logic design, and it works well. ... I have a few papers regarding combined fuzzy logic and genetic algorithm. But in those works, MATLAB or C language were used but not ... MODELS or TACS. Anyway, as per your suggestion, I will contact JAUG regarding my problem."*

A UPFC (Unified Power Flow Controller) can be modeled using ATP as explained in E-mail of the EEUG list server. Dated September 18th, this was from Francisco Javier Penaloza Sanchez of CFE LAPEM Delegación Centro Occidente in Morelia, Michoacán, Mexico. He explained: *"A detailed ATP / EMTP model for the UPFC and a very comprehensive description of its functionality is given in this paper: Kalyan K. Sen, Eric J. Stacey, 'UPFC - Unified Power Flow Controller - Theory, Modelling and Application,' IEEE Trans. on Power Delivery, Vol. 13, No. 4, October 1998. Also, it is useful to consider two earlier papers from Dr. Sen, one about STATCOM and the other on SSSC --- both with ATP / EMTP models."*

Subharmonics Allowed in HFS

The term *subharmonics* (frequencies below the power frequency) will not be found in any previous newsletter. Are subharmonics permissible within the HARMONIC FREQUENCY SCAN (HFS) framework? This was the important new question from Carlos Pinheiro of General Electric in Phoenix, Arizona. On November 12th, his semi-public inquiry via the EEUG list server explained the need to *"model a system that contains harmonic sources from cyclo-converters. Typical harmonic currents generated by these sources include sub-harmonic frequencies (i.e., 0.1, 0.2, etc.). From the results, it appears that the ATP program cannot handle frequencies below the*

fundamental." Immediately and publicly, HFS founding father Gabor Furst seemed unconcerned. But the following day, privately, he made a strong case for generalization: *"Recent papers suggest that certain power electronic devices, typically cyclo converters, will generate sub-harmonics; and they also suggest that HFS could be of some help in analyzing certain sub-harmonic or ferro resonance system problems. ... The Band-Aid I suggested was to fool ATP into seeing the minimum frequency as the fundamental (power frequency) ... This I believe is quite legitimate ... Unfortunately, it does not entirely solve the problem because it causes the special HFS plotting and post processor programs ... to do things that are not quite right, because they see the wrong fundamental to which some of the harmonic index calculations are related. ... The clean solution would be to allow the user of HFS to enter harmonic values h less than unity."* This was what your Editor decided to do, as rapidly as possible.

Subharmonics within HARMONIC FREQUENCY SCAN (HFS) first became operational on November 19th when UTPF segments OVER4, SUBR5, and OVER8 were modified appropriately. New 16th and 17th subcases of DCNEW-21 illustrate use. Data are the same as the 3rd and the 4th subcases except for the added excitation at 25 Hz, which is half the power frequency (harmonic number h = 0.5) . To make room for these two new subcases, the former 16th subcase simply was moved downward to become the 18th. There is good reason to keep it last.

A source card at the power frequency no longer is required to appear first among source cards. This is a relaxation of former restrictions, about which users should be forewarned. Neither the minimum frequency nor the power frequency is required to appear first, as the 16th subcase of DCNEW-21 illustrates. No matter where they are located within source cards, entries corresponding to the power frequency will be located by ATP, and should be part of the interpreted data that precedes the first phasor solution. But the phasor solutions always will appear in order of increasing frequency in the .LIS file and the .PL4 file regardless of the order of source data.

USE HARMONIC NUMBERS and FREQUENCY IN HERTZ are optional new English-language declarations that will be recognized immediately prior to the first source card (see comment cards in DCNEW-21) . If such a declaration is present, it should override the implicit choice between harmonic number and Hertz. Note that ambiguity between harmonic number 1 and 1.0 Hz thus can be avoided without the necessity of perturbing the 1-Hz frequency slightly.

Beware of batch-mode plotting, and the RMS and THD values that result from it. Until code is reworked, no harmonic below the power frequency will be displayed, and RMS and THD values probably will be missing the contributions from subharmonics. Improvement November 20th, when code that produces RMS and THD within SERIES was reworked: As long as the plot request of the user includes all harmonics, the RMS and THD printout should, too. The batch-mode plot is unchanged, however, and it will be missing all subharmonics.

Frequency Scans and Harmonics

CREATE HARMONIC SOURCES (CHS) connects with a harmonic source generator that first became available in ATP on December 16th. Code was communicated to your Editor as an attachment to E-mail from Orlando Hevia of UTN in Santa Fe, Argentina. Dated December 6th, this stated: *"I send you the source code of the routine to generate HFS sources for diode/thyristor bridges. I send a data case with its complete output, too."* Earlier that same day, Mr. Hevia introduced the subject with an offer: *"I was working with a routine to generate sources for HFS --- comparable to HSOURCE by Gabor Furst. My first try was an independent program, but then I inserted it in ATP. Of course, it is only a home test. If you agree, it may be part of next version of ATP. And with more work, it may be used in line ... Please send your comments."* Without understanding much about such ATP source generation, your Editor accepted the offer: *"As a general principle, I agree that we do want to bring small utilities into ATP."* New name HSOURC is being used, with code appended to new UTPF segment HEIDLR. Operation is documented by a new 3rd subcase of DC-15 .

Quickly, new UTPF segment HEIDLR was modified as Mr. Hevia summarized in E-mail dated December 18th: *"I added a new type of device ... a TCR (Thyristor Controlled Reactor) . The data are Current RMS (fundamental), frequency, phase, conducting angle, maximum harmonics, and a key,"* with the last of these controlling the preservation or deletion of triplen harmonics. Operation is demonstrated by that new 3rd subcase of DC-15 .

Estimate Actual Table Sizes

ESTIMATE ACTUAL TABLE SIZES (EATS) entered the UTPF November 12th as illustrated by a new 3rd subcase of DCNEW-2 (added the same day). Although not much has changed during the past 3 years, addition to the UTPF is significant because it makes EATS universal (previously, it was limited to minor updates using the Salford compiler). New UTPF segment ESTIMA of some 4450 lines begins with a short subroutine of this same name. Possibly called from SUBR1, this is the gateway to the estimation of list sizes as explained in the April, 1999, issue. An explicit EATS declaration is one way to use ESTIMA, and this way is illustrated by DCNEW-2. But an extraneous minus sign on STARTUP variable TENFLZ is another way --- an implicit way. This latter alternative is most practical because it avoids change to the data. When TENFLZ < 0,

separate disk file EATSDATA.LIS is assumed by ATP to contain of the appropriate EATS declaration and associated data cards. This one disk file is located by ATPDIR (if defined), and can apply to a family of data cases.

78 MODELS Test Cases of Dube

"C language of user-supplied source code" had been ignored, as mentioned in the January issue. This is why only 75 of Dube's 78 MODELS test cases initially were being verified. Well, Orlando Hevia had worked on his own to rebuild the missing code, as reported in E-mail dated November 10th. He came reasonably close: *"I continued my experiments with C programs to add the last three data files to DCN28.DAT. I do not know anything about C, but I put to work cfun.dat and cmodel.dat ... randomc.dat runs, but ... I know that C and FORTRAN have a RAND function, I know how to call it from FORTRAN, but I do not know how to call it from C. I send the C files, fgnmod.f, and the .lis file as I obtain with the last three cases of dcn28.dat Maybe a C expert (e.g., Masahiro) could help with this."* Reading this, your Editor suddenly thought about E-mail archives as a possible backup source. Without difficulty, he found the name cfun.c in a message from MODELS author Dube dated 7 August 1995, and this explained precisely what was wanted for the Salford C compiler: *"The 3 test cases to run are located in D:\LD ... The results from running cfun and cmodel should match the .lis files in D:\LD\TESTREF. The results from randomc are always different (the C routine uses its own seeding by calling a C library routine that seeds using date-time). Here is the source code of each procedure ..."* There followed listings of D:\ATP\CFUN.C, CMODEL.C, and CRANDOM.C which were sent to Mr. Hevia later that same day and saved at home as f:\atp\foreign.c Mr. Hevia reported success in E-mail dated November 12th : *"Well, the cases run correctly now. The seed can be avoided easily if you comment the corresponding line x:= seed() in randomc.dat to obtain the same numbers each execution."* This is the simplest way to produce desired repeatability: modify the data.

Use of Dube's C at BPA required more time. Salford was done first, although installation of the Salford C compiler was required, and this was far from trivial (see separate story). GNU Mingw32 followed, as pursued by Dr. Tsu-huei Liu on December 11th. Compilation was not a problem, but linking (satisfying all of Dube's C-language externals) required some trial and error. Use of a double underscore within the C-language code of Mingw32 ATP is neither understood nor appreciated. But the need exists at BPA as documented in E-mail dated December 12th. Your Editor wrote to Orlando Hevia in Santa Fe as follows: *"let me document the 2 changed lines of crandom.c :*

```
double c_seed__(void)  ...
double c_random__(void)  ...
```

Now, the two names end in a double underscore. This works. Previously (what failed), there was a single underscore." Mr. Hevia had supplied the GNU C following his own adaptation of Dube's Salford C to GNU, of course. Although Hevia's C compiled without incident, it failed to satisfy the C_SEED and C_RANDOM externals during linking. So, the second underscore was added.

Watcom became the 3rd Wintel ATP version to support Dube's C on December 13th. The previous day, Dr. Liu had adapted the Mingw32 C to Watcom by trial and error. The Watcom answers to DCNEW-28 finally agree with the Mingw32 answers except for the random numbers produced by CRANDOM.DAT. Answers are both consistent and repeatable for any one version, but they differ from any other version because the random number generator is not yet being initialized in universal fashion at execution time.

A `$UNITS, -1, -1` declaration has been illustrated by DC-26 for years. The associated comment explains: *"Restore whatever XOPT and COPT existed before preceding $UNITS."* I.e., by design, this is to be the second or later use. But what if it is not? What if it is the **first** use? Results might be disastrous, as first pointed out to your Editor in E-mail dated October 31st . This was from Orlando Hevia of UTN in Santa Fe, Argentina, who in turn traced the realization to E-mail from Gabor Furst on 27 September 1999 (*"He is really the discoverer of the BCTRAN problem with $UNITS. But his complaint was lost in space-time ..."*) . So, your editor added protection to CIMAGE the following day. A new warning message is illustrated by DC-6: *"*** Warning. This is the first $UNITS request. Ignore it. Restoration is not possible since there is nothing to undo."* This is followed by the expected interpreted $UNITS line, which should confirm the lack of change (equivalent to rejection).

Juan Martinez Stresses PCVP loop

$DISABLE is fundamentally different from nearly all other $-cards in that it is honored as data first is read from the user's input data file. This is in OVER1, at the start of processing that is associated with each new disk file of data. Of course, it is most efficient to discard immediately any data that will not later be used. This is why $DISABLE and NOCOMM = 1 (to destroy comment cards) are recognized in OVER1 rather than later within CIMAGE (where other $-cards are recognized). Recall CIMAGE is the subroutine that ATP calls when ATP is ready to work on the next input data card. So far, so good. The OVER1 code does not require change. But CIMAGE did, to satisfy creative recent ideas of Prof. Juan Martinez. September 14th, he had sent 3 messages, and the first of these had *"Subject: Problems with $ENABLE/DISABLE."* After some study, your Editor quickly realized that Prof. Martinez was attempting what never before had been imagined: *dynamic* $DISABLE. The previous writing is about *static* $DISABLE --- use that exists in the disk file of the user. This is not what Prof. Martinez was attempting

within DISABLE3.DAT The $DISABLE card that was being mishandled was one that he had created internally during the execution of a $PARAMETER block. He wrote: *"One branch card should wake up and the other should remain sleeping. ... The $PARAMETER blocks do work, but something is wrong with the $DISABLE card."* Yes, there **was** something wrong, prior to an addition to CIMAGE on September 16th. Use is illustrated by a new 14th subcase of DCNEW-25.

"Use of character strings along with mathematics first was suggested for IF blocks by Prof. Martinez." Thus began a paragraph in the October issue. Although the plural *strings* is used, operation failed for the 2nd of two such uses prior to the addition of one line to MATDAT on September 15th. Once again, it was Prof. Martinez who first reported the trouble. This was the previous day, with disk file DISABLE0.DAT illustrating the problem. To ensure continued correct operation, such data has been appended as new 12th and 13th subcases of DCNEW-25. The first of these results in an error termination (KILL = 4) because names BLOCK_A1 and BLOCK_A2 were not different within the first 6 bytes. To produce correct operation in subcase 13, your Editor modified the second name to become A2_BLOCK .

A DO loop in ATP data was introduced in the April, 1999, issue, and is illustrated by DC-58. In E-mail dated September 14th, Prof. Martinez requested an extension: *"The files I am attaching are aimed at combining two interesting capabilities: 1) TO SUPPORTING PROGRAM and 2) DO loops."* Attached data files DOTEST0*.DAT revealed a desire to have a $INCLUDE line within the DO loop. More precisely, Prof. Martinez wanted the $INCLUDE line to be replaced by the content of the associated disk file. Prior to the modification of OVER1 on September 24th, this was not being done. As an illustration of the new capability, see the new 1st subcase of DC-8. The only potential problem is for some user who might not want the evaluation. Any such person is asked to write to program developers in order that an exception might be provided. But unless and/or until some user has a practical problem, the rule for $INCLUDE within a DO loop remains as proposed by Prof. Martinez. Warning: logic as initially coded is simple. Neither $PREFIX nor $SUFFIX is being honored, and nesting (one $INCLUDE inside of another) is prohibited. Any such extensions will be ignored within the DO loop.

A new 1st subcase of DCNEW-2 was added to illustrate *"simultaneous usage of $PARAMETER blocks and DO loops, which are used to serialize power network branches."* This is the way Prof. Juan Martinez described his latest observation of inadequacy of new ATP tools. This was in an E-mail message dated October 16th. The attached small example NEWDIS2.DAT served as a model for the addition, and it demonstrated correction of the problem the following day. The change was simple enough: a single line to re-initialize IOFGND was added to OVER1 .

Branch Data Input Restructured

"KILL = 47. Too many saturable TRANSFORMERS have produced overflow of the List-6 table of switch vectors that is used during data input only. ..." This is the error message that your Editor should have encountered while testing that huge data case from Wuhan, China (see mention in the preceding issue). This would be for too small List 6 within NEW LIST SIZES as tables were being decreased in order to save memory. But instead of the KILL = 47 message, ATP reported: *"KILL = 6. The reference branch names of the last data card are illegal ..."* There was nothing wrong with the data, so the KILL = 6 message was confusing at best. Of course, a correction was made: one line was added to OVER4 on November 2nd. About data size, LSWTCH = 400 was acceptable whereas 300 resulted in the just-mentioned error termination.

Pocket Calc. Does TACS Supplemental

Compiled TACS is incompatible with TPC, users should be forewarned. This is not an issue for COMPILED TACS USE (CTU) since in this case the entire subroutine TACSUP is avoided in favor of the dedicated compiled TACS module. But COMPILED TACS MAKE (CTM) uses TACSUP, and would result in incomplete output if used together with TPC. A warning message will inform the user that compiled TACS has precedence, should both CTM and TPC be used together. In effect, the TPC declaration is ignored, if it is used together with CTM.

Minimization of the overhead of starting and stopping was the final improvement to speed MATHCOMP data, and this was satisfyingly successful :

```
TACS POCKET CALCULATOR, in-line code:  9.20
```

This corresponds to 17.66 seconds for best 5 of 6 trials following the change. The TAL ratio of 9.9 three years ago has been exceeded. A ratio of 10.6 was measured March 2nd. No longer are any apologies or explanations required. Present automatic use of the pocket calculator beats the manual application of human intelligence 3 years ago. How is this possible? Outside the dT loop, the latest logic checks for naturally-ordered supplemental variables, and provides for automatic continuation from one to the other whenever two or more consecutive ones are observed. For the MATHCOMP data, all 60 remain in order, and can be evaluated together. Fortunately, neither original TACS author Dube nor TACS reformer Ma Ren-ming tampered with this detail, your Editor found. The hand-coded assembly language of 3 years ago executed all instructions together without stopping, and now the pocket calculator does likewise. But is this enough to explain the superiority? Probably not. The higher-level instructions being used today might be equally important. Both details are important to squeeze the last drop of performance out of the new TACSUP code. Your Editor is wearing a watermelon

smile as he reports the final statistic: the pocket calculator is more than 81 times the speed of Dube's MODELS for the same 60 variables of MATHCOMP. Case closed.

JARRAY was mentioned in the October issue. Beginning August 23rd, the burden from SCONST was eliminated by avoidance --- by preventing Schultz's consideration of this one vector. This is using PARTIAL TABLE DUMPING (warning: there is no change if the old table dumping and restoring logic is used). At first, there was some concern about the wasteful handling of those zero runs (one per JMarti mode). But again, perspective must be maintained. For START AGAIN use, there are no embedded zero runs. Even for use with STATISTICS / SYSTEMATIC there is none if there is no base case, or whenever the program is working on energizations. The embedded zero runs only occur once for dumping, and this is at the start of the base case. By ignoring them, ATP is merely treating base-case tables the same as it treats tables for the energizations.

The movement of JMarti initialization from overlay 13 to overlay 12 was proposed by BPA's Tsu-huei Liu as an alternative way to solve the JARRAY overflow problem of GNU ATP. For the historical record, this was August 21st. While your Editor did not dispute the theory, he vetoed the proposal as being too dangerous (too much work and too many changes). As an alternative, he recommended the non-zero fill of SCONST in INDIST at data-input time, using FLTINF. But Dr. Liu discovered that superposition was used, so she chose the near-zero FLZERO instead. The job was finished, and your Editor was ready to make the change permanent (movement to the UTPF) when he realized the simpler solution using PTD (see the story immediately below), which continues to be reformed.

Interactive Plotting Programs

The IEEE COMTRADE story was given another chapter (see the preceding issue for the first chapter) some two months after the writing that argued against such ATP output. On September 27th , Rick Turner of Relay Application Innovation, Inc. in Pullman, Washington (the home of Schweitzer), wrote: *"I am in need of a program to convert PL4 files to COMTRADE. Are you aware of such a program?"* Of course, your Editor mentioned that both TPPLOT and GTPPLOT will do the job. The following day, Mr. Turner explained more of what he had in mind: *"... a program that will accept a list of filenames and convert the said list to COMTRADE without operator intervention. ... As it is now, the plot program that I use can convert the file that is plotted, but is not able to be used in a batch mode."* Later that same day, your Editor responded: *"Well, the next issue of the newsletter (January) should have a paragraph about Jules and COMTRADE. I claim conversion can be done in a batch file. Then, to do 2 or more, one would put a batch file within a batch file much as we do for run.bat (each test case requires 1 line that begins with runtp)."* About already having a program to do the job interactively, your Editor observed: *"You are in Pullman. If your name were Folkers, I would understand. Are there any other good reasons not to use interactive MS Windows programs such as TOP (which Folkers used at SEL)?"* To this, Mr. Turner responded (also on the 28th): *"I do have access to TOP but since it is a Windows based app, it doesn't lend itself to batch mode processing (unless I've missed something along the way). For relay testing purposes, I may create 10 to 100 files and would like an easy way to convert all of the output files at once without having to open and convert the files on an individual basis."* The following day, your Editor sent a copy of the preceding writing with the following explanation: *"I agree. This is a problem with the average interactive program that requires mouse input. I am not a fan, and neither is Orlando. The mouse is fine as an extension to the keyboard. It is* ***not*** *fine as a replacement for the keyboard. Batch-mode execution often is important, as you certainly realize, for families of studies. ... If you want to be the guinea pig for the proposed DOS utility, let me know. Note that Salford DBOS will be required, however. If you want to avoid DBOS, raise the issue with Orlando. I will add a copy to him."*

Orlando Hevia clarified the support of his program as follows: *"GTPPLOT can read a command file and process a lot of .PL4 files to convert to COMTRADE. It would be possible to create a pl4tocom program, but surely it would be less flexible than GTPPLOT. ... GTPPLOT is available under native DOS (DJGPP), Windows 95-98-ME-2000-NT (XP?), and Linux, all with the same features."* So, your Editor promptly abandoned his proposal to enhance Salford TPPLOT: *"I retract my offer. I have no intention of reinventing the wheel."* On October 1st, Mr. Turner closed the story happily: *"I have been able to use GTPPLOT to plot the .PL4 files, as well as to convert them to COMTRADE. Additionally, I was successful in automating the process of converting a series of files. ... I now have a batch file to generate the .PL4 files and another to create the COMTRADE files ... just what I needed."*

Partial Table Dumping (PTD)

Inability of Mingw32 ATP to use Salford WRITEs to LUNIT2 was realized August 7th. Execution of Mingw32 ATP failed late in DC-24 --- in the 3rd of 3 subcases. Both Salford and Watcom can handle the same LUNIT2 logic without difficulty, but Mingw32 can not. All 3 versions were adapted to use the same LU2XXX modules. All (RED, WRT, OPN, CLS, REW) are Salford except REW, and for this Watcom and GNU are the same. Watcom ATP correctly handles all test cases whereas Mingw32 ATP executes correctly for DC-32 and 49, and for DC-16; but it fails using DC-24. Damn! Not just djgpp, but also Mingw32, need C-like I/O to relieve the burden on the OS,

it would seem. Masahiro Kan's C (see CLIKE.C in the April, 1999, issue) seems to have been a lifesaver for Mingw32 as well as djgpp. This may not have been obvious during 1999, when Schultz's modularization was used with all compilers; but it certainly is obvious today as some of the shorter vectors are handled in line using higher-level WRITEs to LUNIT2. What seems best for Salford ATP is unreliable using the current Mingw32 compiler.

Conclusion : PTD remains obvious progress. But for maximum efficiency, it must be implemented in different ways for Salford ATP and Mingw32 ATP. Salford ATP must use in-line WRITE statements involving LUNIT2 whereas Mingw32 ATP must continue to use Schultz's modularization. There are two or more different optimal solutions for different compilers of interest, unfortunately. Due to weaknesses of compilers of current interest, PTD can not implemented as easily as originally hoped.

ISTDMP is a new variable that controls experimental table dumping, erasing, and restoring --- a diagnostic tool that became available August 25th. The concept is simple: before dumping and restoring tables as part of a simulation for which the answer is not known, it is prudent to verify operation as part of a simulation for which the answer already **is** known. Positive ISTDMP will do this. It is the step number upon the completion of which tables will be dumped, zeroed by new TAPZER (the numeric storage, anyway; character storage will simply be made uniform), and restored. Then the simulation will continue as if the test had never been requested. Upon completion, if the restoration was performed correctly, only one line of the .LIS file should be different for each subcase that involves simulation. There should be one extra line that documents the time of the extraneous transfers. For example, the 2nd subcase of DC7.LIS includes the following extra line :

```
==== Table dumping  ...  Time [sec] = 1.98 ...
```

This is the same labeling that would be used for Monte Carlo simulations, and it mentions *all subsequent restorations.* In fact, there always will be just one per subcase. Tables will be restored immediately after the dumping and erasing, so this test should not affect the answer (solution voltages, currents, etc.) in any other way.

Miscellaneous Intel PC Information

Eclipse is IBM's new name for an open-software coalition to oppose MS (Windows) and Sun (Solaris and Java). This is the conclusion your Editor draws from a *New York Times* story dated November 5th, which has title *"Some I.B.M. software tools to be put in public domain."* This would seem to be a continuation of the trend noted in the July, 2000, issue. Having failed using its own OS/2, IBM now sees free Linux as being more attractive than the proprietary alternatives of competitors. The story begins: *"I.B.M. ... plans to announce today that it is placing $40 million of its software tools in the public domain as the first step toward founding an open-source organization for developers. ... The new open-source organization, called Eclipse, will focus on the programming tools used to build applications and other software. More than 150 software companies ... are lined up to join the Eclipse community. The group plans to establish a governing board later this month ..."* Although late in the OS game, there is hope because of the Web: *"Eclipse, analysts say, is a break from the proprietary pattern, and it is coming at a crucial juncture for the industry. The Internet is evolving beyond a medium for viewing Web pages and downloading information and entertainment. Instead, the Internet is in effect becoming the equivalent of an operating system ..."* According to one analyst, IBM *"is betting that opening up the software tools ecosystem will work to its advantage."* This is the reinvented IBM. Yes, it continues to sell computers. But a bigger business seems to be the provision of comprehensive solutions to computer-related problems (read about the proposed HP and Compaq merger in the preceding issue). An IBM vice president actually is quoted as saying: *"Customers do not want to be locked into one platform for their information technology infrastructure, and developers do not want to be locked into a single state of mind for development."* This sounds a lot like the Sun line during the mid-to-late '80s. At the time, any such statement would have been considered heresy at IBM, your Editor suspects. But times change. IBM and DEC no longer are in control. Of course, it always is prudent to be skeptical about alleged coalitions. Remember the Open Software Foundation (OSF)? What a joke that turned out to be. In theory, OSF, too, enjoyed the support of nearly everyone (including IBM and DEC) except AT&T and Sun (the great Unix promoters of the late '80s) .

Miscellaneous Small Items

MAGVOLT was a data case that involved the erroneous use of MODELS as part of time simulation within a PCVP loop. The data came from Orlando Hevia, attached to E-mail dated May 9th. Prior to May 19th corrections to SUBR1, TACS1, and TACS2, the solution was wrong for the 2nd and later pass. To be sure simulation remains correct, DCNEW-25 was expanded to include a new 11th subcase. Involvement of the MODELS interface routines TACS1 and TACS2 should come as no surprise, but why SUBR1? Initialization was found to be lacking. This was the least obvious part of the experimentation. After MAGVOLT was made to simulate properly by itself, placement as the 11th subcase resulted in output that differed in cosmetic ways. One of these was unwanted printout of phasor branch flows for unexcited branches. Eventually it was discovered that a preceding F-scan had not been terminated completely. The single new line FMINFS = 0 in SUBR1 did the job.

START AGAIN was incompatible with TACS prior to a simple correction to TABLES on May 26th. Trouble first was reported the previous day by Dr. Michael Steurer of

CAPS at Florida State University in Tallahassee: *"Probably others would simply quit and tell everyone that they could not get this feature to work, but I persist!"* We should all be grateful, as the incompatibility was general, and was demonstrable using the simplest of data. It is believed to have entered the program around 28 January 2000 (our earliest record of expansion), when LSTAT(80) in BLKCOM was expanded to 103 without a corresponding change to LL80 in TABLES (today, this is LL92). It is surprising that trouble was not reported earlier. Part of TACS storage was not being dumped, so naturally could not be restored properly by START AGAIN.

GIFU switches and Prof. Yoshihiro Murai (last mentioned in the October, 2000, issue) have not been forgotten. The subject recently was discussed at length with Dr. Tsuyoshi Funaki of Osaka University in Japan. Your Editor closed his message dated May 29th as follows: *"Recall I had one good quotation about bigger data in the April, 1996, issue: ... 'Nimal tested it by six-transistor, six anti-parallel diode PWM inverter circuit, and the result was fine without any spikes.' ... I do not believe we in Portland ever saw such data. If anyone in Japan has a copy, I would like to add it, or similar data, to DCN17."* About timing of the discussion, Dr. Funaki had mentioned a *"task force of simulation software and modeling for power electronics apparatus in the IEE-Japan surveying and researching committee."* This was in E-mail dated May 27th. It seems Dr. Funaki had been asked *"about the GIFU switching logic in ATP,"* and that he is to make some presentation on the subject. Of course, your Editor promised cooperation: *"Well, we do want your presentation to be accurate. I will do my best to answer your questions."*

A single GIFU switch must be followed by either a diode or a second GIFU switch. For illustrations of these two alternatives, see the 3rd subcase of DCNEW-17 (following diode) and the 4th subcase (a second GIFU switch). If the first GIFU switch is not followed by either a diode or a second GIFU switch, there can be no status change following the experimental step. Without such a possible status change of another device, there would be no reason to dump tables and take the experimental step. If there can be no status change, the step is not experimental at all; the outcome is known in advance, and the dumping of tables was a waste of effort. So, the stated restriction is reasonable. However, prior to additions to OVER4 on May 27th, there was neither a warning message nor an error stop to prevent such inappropriate data. So, an error stop was added: *"Halt in OVER4. 1st GIFU switch is not followed by a 2nd or a diode (needed for the experimental step)."* About first recognition of the need, this resulted from the analysis of data that was part of May 25th E-mail from Dr. Tsuyoshi Funaki of Osaka University in Japan.

But why must a diode *follow* the first GIFU switch (see preceding paragraph)? Does ATP treat a diode differently if it precedes the first GIFU switch? These seemed to be the questions of Dr. Funaki in E-mail dated June 21st. Two days later, your Editor explained: *"For each diode, storage is required, and at present this uses a fixed-dimension array. I worried about overflow for really big data cases, so I restricted use to data having a GIFU switch. Only after the first GIFU switch has been past do I begin storing memory of diodes. So how might we best remove this limitation? It should be easy to honor some new request at the start of switches. This might be reasonable. How about GIFU SWITCH USE … ?"* For an illustration of this new declaration, see the 8th subcase of DCNEW-17. The change to OVER4 was made June 23rd.

STANDLER SURGE FUNCTION (SSF) is the request for the fitting of Orlando Hevia's Type-15 Standler surge function. Use is illustrated by the 9th subcase of DC-13. However, prior to correction on June 3rd, the line that interprets the SSF request card was missing in the .LIS file. That was the extent of the error, however. Following numbers and punched cards were correct. In fact, punched cards included the SSF request as part of the comment cards that document user data.

An executable GNU program is not guaranteed to halt upon division by zero. Responding to this news in the July issue, Orlando Hevia wrote as follows on June 1st: *"This behavior is part of the so called IEEE extended non-stop arithmetic. I see this in a document that I found at www.ibiblio.org/pub/languages/fortran/ch4-5.html There are a lot of files ..."*

The GIFU switch is illustrated in DCNEW-17, to which a 7th subcase was added June 4th. Unlike previous illustrations, the GIFU switch considered here is a Type-13 TACS-controlled switch. There also is a following diode -- which must not be a GIFU switch, it was discovered. The data comes from Dr. Tsuyoshi Funaki of Osaka University in Japan, as documented on comment cards. The data could be simulated by itself without difficulty, but placement immediately after that Master/slave switch dependency of the 6th subcase caused trouble. There was an initialization problem. June 4th, memory of previous Master/slave use was erased by changes to SWITCH and SUBR1.

Real-time simulation for relay testing was last mentioned in the January, 2000, issue. The subject arose again in E-mail dated June 29th from Prof. Mustafa Kizilcay of FH Osnabrueck in Germany. He had just returned from an *"Omicron User Group Meeting in Berlin on Tuesday and Wednesday. As an invited guest speaker, in German I made a short presentation on ATP. The title was: 'Use of ATP for testing of protection relays.' Dr Michael Igel, Alstom, also made a presentation, from the point of view of a relay manufacturer. He uses ATP for relay testing purposes."* About real-time simulation, Prof. Kizilcay explained: *"Siemens of course was present at the meeting in Berlin, making advertisement for Netomac as a real-time simulator ... Also, I was asked whether or not an ATP version will be available in the future for real-time simulation."* Your Editor was

somewhat philosophical about required hardware and software : *"Meaning on a separate microprocessor? Modern supercomputers consist of arrays of them, and Lahey recently was advertising its compiler (the July issue). But who would buy the hardware? Only someone who has a practical use ... If anything creative is to be done using ATP, I suspect the encouragement of someone who believes in the concept will be required --- someone who has (or is willing to purchase) the required hardware and software (some special FORTRAN compiler such as Lahey's) ."*

"/"-card sorting may separate comment cards from the data cards that they are supposed to describe, readers are reminded. Dr. Michael Steurer in Tallahassee, Florida, had inquired about this. In response, your Editor wrote as follows on June 17th: *"About location of comment cards of $INCLUDE, I am convinced that there is no error. Every few years I look at this and conclude that nothing can be done. The problem is this: cards following slash cards are moved. This separates them from preceding comments. If comment cards are killed by NOCOMM = 1, the problem disappears, of course. The problem also disappears if there is no sorting. The problem is a result of the sorting logic, which will move following comment cards but leave preceding ones."*

A TACS-controlled linear inductor L(t) is illustrated by the new 4th subcase of DC-45, which was added July 18th. Since the very early years of ATP (mid-'80s), the TACS CONTROL declaration has existed, and has been illustrated by the 3rd subcase of DC-45 for a nonlinear inductor. But what about a linear one? *Nonlinear* was not to be found in the initial inquiry from CAPS at Florida State University in Tallahassee.. The July 17th message from Dr. Michael Steurer had *"Subject: TACS controllable inductor?"* It went on to inquire about *"something like the TACS type 91 resistor, but inductive."* Yes, why not? As the new 4th subcase shows, TACS-defined L(t) is no more difficult than TACS-defined R(t). The two are comparable. Each requires compensation. Many comments explain the new vector plot, which clearly illustrates the transition from one phasor solution to another. Over a time span of 100 msec (5 cycles at 50 Hz), inductance is being increased smoothly (sinusoidally) by TACS, from 1/8 Henry to 1/2 Henry. The branch current just as smoothly changes from the 7.98-amp asymptote of the BEGIN branch to the 2.61-amp asymptote of the END branch. One graph shows it all for such slow, steady-state adjustment. It works.

NOBEGIN is a utility written by Orlando Hevia to eliminate the stacking of subcases within standard test cases DC*.DAT In E-mail dated August 20th, Mr. Hevia wrote: *"I am using my NOBEGIN program to separate cases from DC* files. The program reads the DCnn.dat and generates DCnn01, DCnn02, etc. In some cases, it is easier to test data cases independently."* The following day, your Editor agreed : *"Yes, it is easier in case of trouble that is not related to preceding data. But execution is faster when data is stacked. This now represents most of the Watcom ATP time for test cases: starting and stopping time. Mingw32 ATP has nearly eliminated this whereas Watcom ATP requires significant fixed overhead for each disk file of data."*

START AGAIN is used to restart a halted simulation, generally following the modification of some key parameter such as a switch closing time (a fault time). Unfortunately, the time step DELTAT is not among the parameters that can be changed, in general. Yet, this is what was done by Dr. Michael Steurer of CAPS at Florida State University in Tallahassee. In E-mail dated September 19th, he reported success: *"I have just restarted the example case ... with a different (smaller) time step ... I looked at the .pl4 files and the time steps there ..."* Your Editor responded the following day : *"You may have restarted it, but that is not the same as claiming that the result is correct. In general, it will not be."* About rationale of his attempt, Dr. Steurer explained: *"... the START AGAIN case does give the option to set DELTAT. And I am pretty sure that if this is not allowed, ATP would complain immediately with the 'You loose, fella ...' statement."* Your Editor then responded: *"It is true that misc. data cards are read. But this is to redefine TMAX , not DELTAT. Well, a KILL termination is not a bad idea. ... We protect against so many other things, why not this one, which is plenty important."* This is what was added: *"KILL = 60. ATP refuses to restart ... Program tables used value xxxxx whereas the user's floating-point miscellaneous data card provided value yyyyy It is not possible to change the time step size dT once simulation has begun."*

INDMOT is Gabor Furst's separate program to generate ATP data cards that represent an induction motor. The January, 2001, issue mentioned that INDMOT was being extended to include synchronous machines. Well, September 18th, Dr. Tsuyoshi Funaki of Osaka University in Japan used the EEUG list server to issue a brief announcement of availability: *"Gabor Furst updated his indmot program. Now it is available at JAUG secured FTP site ..."* The attached writing by author Furst explained: *"I attach the updated version of the Indmot.exe program, Indsynw.exe, which was expanded to include synchronous motor simulation with U.M. Type #1. The file Indsyn.zip includes Indsynw.exe, Indsyn.doc, and Indmot.dat."* Later that same day, author Furst issued clarification: *"The zip file Indsyn.zip is stored in the subdirectory Util. The difference between Indmot.exe and Indsynw.exe is that Indsynw.exe can also handle U. M. type # 1 synchronous motors . Synchronous motor (or generator) data is entered in terms of the PARAMETER FITTING option of SM 58/59, with some simplification. ... This is a DOS program, which can be invoked from Windows' Explorer. Comments re. errors and improvement will be appreciated."*