Can / Am EMTP News

Voice of the Canadian / American EMTP User Group

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Salford FORTRAN Compilers

Pisa-format .PL4 files first were accepted by POSTPROCESS PLOT FILE (PPF) on March 12th, following changes to UTPF segments TSTACS and POSTP1 (the latter is installation-dependent, unfortunately). For an illustration, see the new 4th subcase of DC-46. This produces the same results as the first, although the signal file is Pisa-format rather than conventional, old, C-like. Incentive for the extension can be traced to E-mail from Orlando Hevia of UTN in Santa Fe, Argentina, who wrote as follows on March 7th: *"I received a complaint from a user who wanted to post-process a plot file that was generated by GTPPLOT from a COMTRADE file. The format is C-Pisa. But ATP cannot open this format. I tried the dc45 / dc46 pair with newpl4 = 2, and dc46 produces garbage. ... Must I write a program to convert COMTRADE to C-like? Or will you add the C-Pisa format to PPF?"* In his response later that same day, your Editor wrote: *"Pisa-format files are newer. There was no provision for them when PPF code was added. Your friend must be the first to try and complain … I suppose it makes the most sense to generalize the PPF code. All right, I plan to look at this …"*

The code of TACSUP around S.N. 3294 revealed a significant difference between the version 2.66 Salford compiler as used by your Editor at home and version 3.5 as used at BPA. During the evening of May 13th, code was developed and tested at home without difficulty. The following morning, at BPA, corresponding compilation was halted by a fatal error. The proposed IF-THEN-ENDIF block did include S.N. 3294, to which a possible transfer was made from outside the block. No question, the error message of the new compiler was right. In general, there might have been trouble (in this particular case, there never could have been). So, objection by the newer compiler certainly was appropriate. But the difference was a complete surprise. A significant limitation of version 2.66 has been learned. Fortunately, correction was easy enough: removal of the ENDIF and conversion of the preceding associated IF - THEN to IF - GO TO 4207.

Fortran 95 from Lahey Computer

User-supplied C-language source code for MODELS has not yet been activated for F95 Lahey. As a result, DCNEW-28 is installation-dependent, with the final three subcases (CFUN, CMODEL, and RANDOMC) missing. Following this modification, there was no problem activating this data when first tried on January 26th --- except for the 72nd subcase, which is CURSW. The Lahey simulation within DCNEW-28 differed from the Watcom simulation. But when executed alone, or following the two preceding subcases (see DUMN28), the answers agreed. During examination, logic involving KONCAT within OVER1 was improved: without difficulty, the variable was being used before it was defined. So, a DATA statement was added to initialize this on January 26th.

The simulation of DCNEW-12 failed in SOLVUM because the U.M. believed TACS was involved. Yet, there was no TACS data. A garbage index (huge) was found instead of the correct value zero. Traced to creation in UMDATA, the ALLOCATE of JCLOUT was noted to involve 2 * NCLFIX cells whereas only half of these (NCLFIX) were being zeroed. For a year and a half, lack of initialization went unnoticed. Also noted was this confusing detail: addition of diagnostic printout sometimes provided correction. Once again, this convincingly demonstrates the necessity of zeroing storage that is created dynamically --- a complication of F95 storage that is avoided by use of static F77 COMMON. The correction (full initialization) was made January 27th, and then DCNEW-18 also was handled correctly without any special study (your Editor assumes it involved the same error) .

Lahey DC-58 and DCNEW-2 failed handling the DO loop in data --- a feature that is newer than previous Lahey testing. Inside POCKET, List 9 NONLE is used to store KOMAND, and it must be ALLOCATED along with VOLTI if it does not yet exist at the time of use (service for DO is early). This addition was made January 26th at the same time two other vectors that were not being used, VOLTEX and LSTEXT, were removed. The following day, both test cases were simulated correctly.

TENFLZ and FLZERO are parameters of STARTUP that were mishandled for the 2nd or later subcase of two or more stacked subcases. Redefinition of TENFLZ in SUBR1 should have occurred just once per definition using STARTUP. Instead, below S.N. 4263, this was being executed at the start of each new subcase. The effect, prior to correction by movement to RSTART on January 30th, was to drive TENFLZ rapidly to zero. The user inputs a value of 10, typically. But inside the program, it is multiplied by FLZERO, which typically has value 1.E-12. So, for the first subcase, TENFLZ correctly had near-zero value 1.E-11. But for the second subcase, the value was 1.E-23; for the third it was 1.E-35, etc. Only because F95 Lahey arithmetic was a little different for Dube's CURSW within DCNEW-28 was the problem discovered. The other 3 alternatives all agreed, so your Editor believed Lahey probably was wrong, somehow. But he had no idea how, and was amazed to find a TENFLZ value of around 1.E-301 within the switch logic of OVER16 after a couple of days of searching. Even more surprising was this: following correction of the code, all 4 ATP versions created different .LIS files for DC-21, 22, 45, and 63. The first of these illustrated isolated changes whereas the last was completely different in detail because the numerous valves rapidly began switching on different time steps. For engineering purposes, solutions were little changed. But they nonetheless had been wrong for many years, and no one had noticed (similar to DC-33 as mentioned in the October, 2001, issue). Thanks to F95 Lahey's different performance, an unexplainable difference was noted for a single test case. This was pursued, and code was corrected. Once again, your Editor concludes that it is not possible to have too many compilers or test cases. Program developers should continue to use as many as they can afford (each requires time and effort, of course) .

DC-30 was the final test case requiring reconciliation. Execution died on the 1st time step of the 6th subcase, inside TACSUP. Use of the pocket calculator to compute supplemental variables had been requested in the 5th subcase, and the trouble was traced to leftover pointers of this use. Why such use was a problem for F95 Lahey but not other compilers is unknown, however, since the storage of troubled IBEG and IEND involves normal, old F77 COMMON. In any case, conditional, new initialization was added at the top of OVER2 to solve this problem. This was February 2nd, when testing of F95 Lahey ATP ended some five weeks after it had begun. What a struggle.

News from Outside USA & Canada

ATP short courses may be disappearing from American universities (see mention of former courses in Florida and Minnesota in the July issue). However, such education seems alive and well in Argentina. *"ATP course"* was the *"Subject:"* of E-mail from Orlando Hevia on Sunday, June 9th. This quickly summarized : *"Next Tuesday through Friday, we will give the ATP course entitled 'Simulation of electrical components with ATP.' We will have students from Peru, Bolivia, Paraguay, and of course from Argentina. We are international now. Strangely, no students from Chile"* (Argentina's neighbor to the west, with whom a long border is shared). Of course, your Editor was curious, and he requested more information. Three days later (during the course), instructor Hevia provided a schedule of topics followed by these details: *"The course has the sponsorship of CAUE, and the Secretary of CAUE is a local professor (Ing. Elbio Vaillard), who approves the licenses (the non-disclosure clause was sent to students in PDF format some weeks before the course). A CD with the*

Rule Book (PDF format) and the Theory Book (HTML format), plus ATPDraw, ATP, ALLDAT, etc., is sold at cost (8 pesos = 2 dollars) to interested students." Of course, CAUE is the Argentine user group (think *Committee Argentine of Users of EMTP*). The outline looks comparable to what once was offered by Prof. Carroll in Gainesville except that there is no mention of MODELS (yes, TACS appears). Another difference: the Argentine course spills over onto *"Saturday 15: Practice and answer of hard questions."* Attendance must be encouraging: *"We have two engineers from Paraguay, one from Bolivia, 18 from Argentina, plus two local advanced students."* Of course, Spanish would be the course language, and presumably this would explain the lack of participation from huge, Portuguese-speaking Brazil to the north. The location and sponsor is listed as: *"GISEP (Electric Power System Research Group), Regional Faculty Santa Fe, Universidad Tecnologica Nacional."* Finally, Dr. Walter Gimenez and Eng. Julio C. Turbay were instructors.

More about the Internet and E-mail

Hawala was mentioned in the April issue, where a paragraph ended with a question: how is real value transferred geographically? Gold seems to provide the easiest explanation. *"Al Qaeda's road paved with gold; secret shipments traced ..."* is the title of a February 17th story by Douglas Farah of the *Washington Post*. About the transfer of real value: *"Gold is often used by hawala brokers to balance their books. Hawala dealers also routinely have gold, rather than currency, placed around the globe."* Patrick Jost, formerly with the Treasury Department, is quoted as saying: *"There are no traditional banking systems in Afghanistan or Somalia. Everything is done through hawala, and gold is the fuel hawala runs on."* ARY Gold is described as *"one of Dubai's largest and most prestigious gold bullion and jewelry dealers. ... Abdul Razzak, the Pakistani owner,"* explained life in the real world: *"If you say you want 100 kilos [220 pounds] of gold, I can give you that wherever you want in 12 hours. What you do with it is your business."* Needless to say, American investigators seem to be making little progress. They believe they know what happened in general terms, but seem unable to learn specifics that would be required for legal retribution. With hawala, the detailed records have disappeared long ago, of course. Hawala may be centuries old, but it continues to provide a competitive advantage when compared with conventional banking, so it prospers.

Big Brother was mentioned in the July issue. This name comes from George Orwell's classic book *"1984,"* which first was published in 1949. For readers who are unaware, the idea of monitoring every keystroke of a PC is not fantasy, but rather potential reality, as documented in a February 19th AP story that was found at the Web site of CNN. This has title : *" 'Sneaky' software may be watching you. Latest version can read your keystrokes and snap a pic."* The opening paragraph explains: *"Right now, your boss, your spouse or the government could secretly be reading all your typed words -- even the ones you deleted ..."* Richard Eaton of Kennewick, Washington, is the author of such a spy program named *Investigator*. It seems that more than 200K copies have been sold *"to everyone from suspicious spouses to the FBI."* Consider the rapid escalation of sophistication: *"Eaton is building ever-more-detailed monitoring tricks into his Investigator software. The latest version, released this month, can snap pictures from a Web camera, save screen shots and read keystrokes in multiple languages."* Of course, if a large organization such as BPA were engaged in such spying, it would be logical to do this via the network, so the victims would have no access to records. Even when done on an isolated PC, it is difficult to know: *"The $99 downloadable program runs 'hidden in plain sight.' It changes names every so often, and files containing the information it gathers are given arbitrary old dates to make them difficult to find."* Such computer spying is relatively new: *"Software like Investigator was virtually unknown two years ago."* Of course, there are legitimate uses by police: *"Federal investigators in Seattle used Investigator to snag suspected Russian computer hackers, one of whom was recently convicted on 20 counts including conspiracy, various computer crimes and fraud."* More controversial are uses unrelated to crimes. A private investigator is said to have *"used it to help clients catch employees who send out resumes … or spend their shifts playing games."* Clearly, George Orwell would be proud. His predicted spying has come to pass, although using a technology (personal computers) that was not foreseen. About the author of this latest spy tool: *"A self-taught programmer who says he barely graduated from high school, Eaton stumbled on the idea for Investigator when he wrote a tracker program to help him find and repair software bugs. He started selling it as a snooper product around 1997."*

"Half US Net access is via broadband" is the title of a story posted at *The Register* with date March 6th. The story begins: *"Broadband accounted for more than half of all Net connections in the US in January, according to the latest figures from Nielsen/NetRatings. Broadband users logged a whopping 1.19 billion hours online in January -- an increase of 64 per cent on the year before. In contrast, narrowband time online fell by 3 per cent to 1.14 billion hours."* No question, in the USA, speed is winning.

BPA seemed to blame switch supplier Alcatel for most of its recent network problems (see preceding issue). Kris Korpenfelt shared with his dependents a BPA evaluation (*"From: Sims, Larry J - CIM-2"*) in his E-mail dated March 7th. You think ATP has software problems? Imagine this: *"... traveled to Spokane yesterday to meet with the Alcatel Engineering team. ... They demonstrated that they can create the same problems that we've been having ... We discussed why BPA is seeing this problem with our 35 switch network and other larger networks aren't."* Anyway, Alcatel seems to believe it has a patch. After testing, this

will become Release 23: *"BPA will install Release 23 on the three server switches at HQs and the two server switches at Ross which have been causing the majority of our problems ..."* The belief is that *"this will eliminate the majority of problems that we are currently having with Release 21. ... We expect this upgrade to stabilize the network. ... Once Alcatel releases their Final version of Release 23, we will make plans to implement on all 35 of our servers. (He means switches)"*

Free E-mail has been offered by many sites on the Internet, with Yahoo's *"free email for life"* mentioned in the January, 2000, issue. However, following collapse of the bubble in technology stocks during March of that year, free E-mail has fallen on hard times. *"E-mail is evolving into fee-mail"* is the title of a Yahoo news story dated April 1st. This explains: *"Though free Web-based e-mail hasn't gone away yet, the service offerings are getting fewer, and charges are creeping in. Yahoo just announced pricing plans for automatic forwarding of Yahoo mail to other accounts: $19.99 a year if you sign up now; $29.99 after April 24. Mail.com charges $39.95 for the same service; extra storage starts at $29.95 yearly."* But why might extra storage be needed? Because mail services typically do not block junk mail (spam) well. One user explained that *"he would never pay for Hotmail because of the heavy spam the account attracts."* What is MS's excuse? *"Hotmail is one of the largest e-mail services, so we're a target for spammers."* When and how did MS begin its service, and how has it grown? *"Microsoft bought the then-8.5-million-member Hotmail in 1998 for $400 million, seeing it as a vehicle to market its products. Today, it claims more than 110 million total members."* When it comes to spam, MS has an obvious conflict of interest, however. Spam fills mailboxes, allowing MS to propose more space at a price (*"Buy more storage space for $19.95 a year"*). And Yahoo? *"Accounts have been reset to automatically accept blurbs for everything from products to job offers and matchmaking services. The only out is for members to go back in and check 'no' in each category within the next 60 days."* Clearly, the pressure on free E-mail is mounting, and AOL must be laughing all the way to the bank: *"E-mail is included in America Online's monthly $23.90 membership fee ... We do not offer a premium e-mail plan because we believe e-mail already is a premium service."*

Amazon sells used books? Your Editor was surprised to learn of this profitable extension to new-book sales while reading a *New York Times* story dated April 10th. *"Online Sales of Used Books Draw Protest"* is the title of the story, which author David Kirkpatrick summarily begins as follows: *"Authors are rebelling against new efforts by Amazon.com ... to spur sales of used books, a practice that has become a major source of revenue for Amazon but pays nothing to writers or publishers."* Had such a book been purchased legitimately once, resistance probably would be reduced. Curiously, advertising by publishers seems to be the common source of supply : *"Free copies sent to potential reviewers were turning up for sale as used books at Amazon.com, usually for a small fraction of the retail price. (Selling review copies as used books was previously limited to stores in New York and other media centers.)"* The dispute is relatively recent: *"Amazon began selling used books in November 2000, adding links that offer much cheaper used books to the same pages that showcased the more expensive new copies."* About importance of the extension: *"a spokeswoman for Amazon ... said used books were very popular, accounting for more than 15 percent of Amazon's book sales in the second half last year."* But how big are Internet book sales? *"Total online book sales account for less than 10 percent of all book sales, according to the Ipsos-NPD Group ... so online sales of used books are not soon likely to bankrupt the industry."* Finally, what about Amazon competitor Barnes and Noble (B&N)? It is favored by writers because it *"sells used books only from a separate part of its Web site."*

The *"From:"* address of E-mail is not necessarily meaningful. This is why messages having unexpected or unusual content must be suspect, and why signatures on real paper continue to be required for licenses (subscription to the EEUG list server). Proof positive emerged from a discussion among list server moderators that was begun by EEUG Deputy Chairman Laszlo Prikler. In E-mail dated May 4th, he explained: *"Be careful, it is a virus! From time to time I, too, receive such messages sent 'by me' with 'From: prikler@eeug.org' or a similar address (e. g. eeug@emtp.org). ... As you know, all of my mail boxes in the @eeug domain are just mail forwarding aliases, so I am unable to send outgoing messages with @eeug in the 'From:' line. If the mail shows something else, it clearly indicates that the message was sent by a virus creator who uses stolen addresses. Legal outgoing mail from me must show ... Of course, this might be stolen, as well. So I suggest you delete any strange message from 'me' that is not self explanatory without opening any attachment it may carry. ... BTW, I also received that 'Eager to see you' message. The header was ... I send a cc: to other colleagues because I see 3 other virus messages in my mailbox. Maybe a new virus has hit the net."* Two days later, Orlando Hevia provided a detailed reference: *"An interesting description of this virus can be found at http://www.europe.f-secure.com/v-descs/klez.shtml"* Your Editor connected, and noticed the following confirmation about a meaningless sender's address: *"Important Note: The e-mails sent by Klez.E worm often have faked sender's address. The worm randomly picks sender's address from web pages, ICQ databases or Windows Address Books. This means that if you get Klez.E worm in e-mail, it's quite likely that it was* ***not*** *sent to you by the person listed in the 'From' field of e-mail message (sender's address)."* Nearly two months later, *The Register* assessed the damage. *"Klez tops virus charts -- again"* was the title of a story posted July 1st. This explained: *"Variants of the Klez worm were by far the most common viruses circulating on the Internet this month. Again. ... Virus infection rates are currently running at around one per 240 emails, which compares to one in 30 infected emails at the heights of the Goner and*

Love Bug epidemics." Once again, note the connection to Bill G: *"The worm exploits a vulnerability in Microsoft Outlook and Outlook Express ..."* No question, Dr. Liu's mailbox at BPA has received more than its share of Klez-produced messages. June 30th, JAUG Vice Chairman Masahiro Kan provided subscribers of the EEUG list server with some explanation: *"This virus modifies the sender's address ... The modified addresses include 'canam', 'eeug', and the names of the moderators. This implies that someone who has these names in his address book was infected by the virus. Looking at the header of this virus-produced mail, it seems to come from Thailand ... I would like to contact the administrator to check on the status. If someone knows which organization has the domain* ***ksc.th.com****, please let us know. Finally, I strongly recommend that you install anti-virus software on your PC ... if you don't yet have it."*

European EMTP User Group (EEUG)

Vienna, Austria, is to be the site of this year's important annual meeting of EEUG. November 11th through the 13th was the date mentioned by outgoing Chairman Mustafa Kizilcay in an E-mail message dated July 22nd. This year, supporting the organizational talent of Laszlo Prikler in neighboring Budapest will be Prof. Guenther Brauner of the Technical University of Vienna.

A case-study collection was mentioned by Deputy EEUG Chairman Laszlo Prikler in E-mail of the EEUG list server. Dated July 15th, this message explained: *"Mr. Ralph Folkers from SEL Inc, USA, contributed to the ongoing ATP load flow discussion ... a valuable example case. The case is a 6-bus example and ATPDraw has been used as interface for data input. The contribution has been added to the (slowly developing) Case Study collection at the EEUG web site ... www.eeug.org -> Case studies. A single page summary can be found there with direct links to a 6-page PDF file and the zip compressed ATPDraw project, LIB and ATP-files. To download the complete case you need a valid EEUG secure web password."* Of course, SEL indicates what your Editor continues to refer to as Schweitzer (e.g., see the April issue).

Line and Cable Constants

More than 16 SC (Single-Core) coaxial cables first were handled successfully by CABLE PARAMETERS (CP) following a correction to NEWCBL by BPA's Dr. Tsu-huei Liu. The data tested at BPA involved 39 SC cables as established by Andrea Mansoldo of Pirelli Cavi e Sistemi in Italy. Disk file EXA39CP.DAT was created from the attachment to E-mail dated July 31st, and ATP first choked on it while trying to read the 16I5 integer data that specifies the number of conductors for each SC cable. In ATP (as opposed to Prof. Akihiro Ametani's own original, separate program), no provision had been made for 2 or more such data cards prior to the generalization on August 1st. Mr. Mansoldo's case required 3 data cards --- two full cards of 16 integers followed by a terminating card to carry the remaining 7.

"100 coupled conductors of CABLE PARAMETERS" was the first line of a paragraph in the July, 2000, issue. This mentioned a request by *"Ashok Parsotam of Vector Ltd. in Auckland, New Zealand."* The story can now be continued. Mr. Parsotam had contributed to the discussion of larger limits that was started by Pirelli (see preceding paragraph), and his E-mail dated August 5th documents the expanding envelope as follows: *"Further to my request for 50 cables with 151 conductors mutually-coupled, I am now wondering how many such pi sections ... can be modelled using ATP. I use these ... to calculate longitudinal induction in parallel conductors (i.e. power and telephone conductors, power and metallic water mains, etc.). At the moment, I am satisfied with steady-state phasor solutions. However, time domain analysis may be necessary for such mutually coupled underground conductors where transient over voltages can occur. I also use these mutually-coupled network models to calculate ground potential rise and the fault return currents through various grounded conductors during single phase to earth faults."* So, August 6th, Dr. Tsu-huei Liu and your Editor decided to create the enlarged CP capability using Mingw32 ATP. Within F:\GNUNT, VARDI151.BAT uses LISTSIZE.151 which has List 31 expanded from the usual 240K to 3800K words. The theory was undeniable, but initial results were disastrous. Not only did execution hang immediately after ATP interpretation of the CP declaration, this output line showed a limiting number of conductors that was negative! Quite unexpected was the cause: overflow of 32-bit integer arithmetic as used by the MAIN27 formula below S.N. 5934. The discriminant D7 of the quadratic formula was floating point, but it involved integer math on the right hand side: D7 = 9216 + 648 * N4 This overflowed, and execution was **not** halted by MS Windows 2000. We seem to have yet another illustration of sloppy supervision of a GNU-produced program. There is similarity to failure to stop upon division by zero, which was mentioned in the July, 2001, issue. Anyway, following conversion to floating point, execution was uneventful. The result showed: *"Prof. Akihiro Ametani`s 1994 code. Order = 152 ..."*

Pi-circuits that are punched by either CC and CP should be able to exceed the original 2-column limit of 99 without difficulty as this note is being keyed on August 8th. CP was expanded first, the previous month. Then, on August 7th, Ashok Parsotam of Vector Ltd. in Auckland, New Zealand, reminded program developers that he was using CC, not CP. His E-mail correctly observed that *"the current limit is 99 mutually coupled conductors."* But why use CC rather than newer CP? The punched output that automatically produces a cascade connection of Pi-circuits to represent a cross-bonded cable is not available in newer CP. Well, no problem; the limit of 99 was removed easily enough by

changes to 4 locations within DATOUT. Note that use of such high-order branch cards should not be a problem. HIGH ORDER PI CIRCUIT (HOPC) has been mentioned many times since its introduction in the April, 1998, issue. The simulation code already has been tested using much higher order Pi-circuits than CC or CP probably ever will accommodate. Note that the limit of 99 cascaded Pi-circuits will remain, however. The user can have more coupled phases than ladder-connected sections!

DEC ATP for VAX / Open VMS

NEWPL4 = 2 represents a request for Pisa-format .PL4 files as illustrated by isolated subcases within DCNEW-21 and 22. But Pisa-format .PL4 files are a special type of C-like .PL4 file, and VAX ATP does not yet support any C-like .PL4 file. So, VAX ATP remains fundamentally incompatible. Prior to removal of the NEWPL4 definitions, execution ended cleanly and without explanation within STOPTP. Unless and/or until someone familiar with VAX C is willing and able to modify Masahiro Kan's C for GNU, VAX ATP probably will remain unable to support Pisa-format .PL4 files. I.e., DCNEW-21, 22, and the 4th subcase of DC-46 will remain installation-dependent for VAX ATP. Recall F77 Salford and F95 Lahey ATP versions have no problem because the C-like writing and reading can be done easily using FORTRAN. Watcom ATP is able to do the same thing, although not easily (two different record lengths RECL= are used, and the logic is a little precarious). No such tricks were known for GNU, however, so real C was written by Masahiro Kan of Toshiba Corporation in Japan. Unless someone knows a Watcom-like trick of VAX FORTRAN that would allow the avoidance of C, Mr. Kan's real C seems to offer the greatest hope. What VAX ATP user would be willing to do the conversion (from GNU to VAX) and testing (using VMS) ?

Creation of a FORMATTED .PL4 file resulted in single-precision accuracy for printout of the final time step in the .LIS file. Although the error first was noticed while experimenting with VAX ATP using DC-49, in fact the trouble later was demonstrated using DC-32 (the error had nothing to do with table dumping or restoring) and Salford EMTP. In fact, the error was in universal SPYINK, to which an addition was made April 20th. The trouble now will be briefly summarized. On the final dT, plot points that have been held in RAM are flushed to the .PL4 file on disk because ICAT > 0 and LUNIT4 < 0. For either a FORMATTED or an UNFORMATTED .PL4 file, SPY performs this function in the batch mode. But if and only if the .PL4 file is FORMATTED, the REAL*8 output vector BVALUE is used as an interface with FORML4. Then, upon completion of such dumping, BVALUE was being restored from storage of the REAL*4 plot points. This is how precision was reduced. Correction was easy enough, assuming that the output vector is not more than half full (i.e., the number of output variables does not exceed half of List 12). If there is insufficient space, there will be a warning message. This can be illustrated using Salford EMTP with DC-32: *"List 12 is more than half full, so printout of the final step will be 32-bit. N22, LSIZ12 = 42 55."* Here N22 is the number of output variables, and List 12 was artificially reduced to 55 to provoke this warning message. To document the associated loss of precision, consider the first 3 numbers in the 4th row of the final time step of DC32.LIS These are node voltages. Compare the exact answers (normal output) with the 32-bit answers that are produced when a FORMATTED .PL4 file is requested :

```
Node name:       1-B          1-A         GENA
C-like:   -97.228251  100.191328  83.5733756
10E8.0:   -97.228249  100.19133   83.5733719
```

Most importantly, the reduced precision always was and is confined to the .LIS file; it can **not** propagate to later simulation via saved tables. The precision of tables always has been, and remains, full.

"Binary switch NEWPL4 of STARTUP allows the user either to accept (value unity) or reject (value zero) new code that will compress the header of a .PL4 file by the removal of unused names." Thus began a story in the April, 1995, newsletter. The feature has been operational for PC-based versions of ATP since that time, but apparently has not been tried using VAX ATP during recent years. According to a note from Dr. Liu dated April 19th, Dan Goldsworthy tried the feature, but could not make it work. Your Editor and Dr. Liu investigated on April 24th, and noted no effect from the altered NEWPL4 value. Although a VAX module HEADM4 was present, it had not been connected to VAX HEADL4. So, the 4 missing lines were added, and operation was demonstrated using a simple example. Results (the .PL4 file) seemed believable. What about other versions? Experimentally, Dr. Liu noted that both Watcom and Lahey ATP remain deficient in the support for NEWPL4 = 1 use. While there is no plan to work on the more complicated Watcom HEADM4, F95 Lahey should be easy due to availability of ACCESS = 'TRANSPARENT' to handle the C-like alternative.

The 3rd subcase of DC-41 required modification in order for VAX ATP execution not to die. April 23rd, the change was documented on perhaps 20 comment cards of DC41.DAT for Salford ATP in order that the complication not be forgotten. In fact, later it was discovered that the problem was universal. VAX ATP demonstrated the problem because FORMATTED .PL4 files are being used. The use of TO SUPPORTING PROGRAM conflicts with this user decision, although peaceful coexistence could be reestablished by means of the addition of $CLOSE and $OPEN for unit LUNIT4 at any location between the end of LINE CONSTANTS data and the blank card that ends node voltage output. Using the same FMTPL4 = 10E8.0, Salford ATP dies with a comparable error message (the DBOS error window reports *"Error: File access and properties are*

incompatible"). The 7th subcase of DCNEW-25 posed the same structural challenge, although a complete cure required more medicine. This change to code was completed May 1st, and it eliminated the need for modified data (those great changes to DC41.DAT were discarded). Changes to SUPORT and REQUES are remarkably simple, yet they remove the conflict between TO SUPPORTING PROGRAM and the FORMATTED .PL4 files. The final resolution is satisfying.

Brain - Damaged MS Windows

"Open-source fight flares at Pentagon" is the title of a story by Jonathan Krim, a Staff Writer for the Washington Post. Published *"May 23, 2002; Page E01,"* this story has subtitle : *"Microsoft lobbies hard against free software."* Of course, *The Pentagon* is the headquarters of the U.S. military, located outside the nation's capitol. The first two paragraphs nicely summarize Bill G's latest effort to maintain his monopoly. MS *"is aggressively lobbying the Pentagon to squelch its growing use of freely distributed computer software and switch to proprietary systems ... The company said 'open source' software threatens security and its intellectual property. But the effort may have backfired. A May 10 report prepared for the Defense Department concluded that open source often results in more secure, less expensive applications and that, if anything, its use should be expanded."* Recall Stu Cook's mention of the *"the US Army home page"* in the October, 2001, issue. We now seem to have high-profile, printed confirmation of concern within the U.S. military about use of MS software. If your Editor were a big MS stockholder, he would worry about the perception of an end to growth, with its associated undesirable tax consequences. Thus far, MS has paid essentially no dividends --- presumably to save Bill G the loss of 40% (the marginal income tax rate for wealthy Americans) in federal taxes. But nothing grows forever exponentially. Once growth ends, there must be payment of substantial (e.g., IBM-like) dividends. If not, why would anyone want to be a stockholder? Either the share price must grow, or dividends must be paid, or both.

A corrupted DOS window of MS Windows 2000 was the observation of your Editor during late June as he and Dr. Tsu-huei Liu pursued misbehavior of Mingw32 ATP using some standard test case. Dr. Liu had noted that execution failed when "S" was used for the output file name (parameter 3 of RUNTP use), but execution was normal if a real (not a symbolic) disk file name was keyed. So, the handling of parameters of batch files was suspect. But investigation revealed nothing. About the failure, it was quick ---essentially instantaneous. Win 2K offered no help. The OS simply opened a small window that explained that an error had occurred. Pursuing the problem with pause statements and diagnostic printout to the screen, an hour or so later it was discovered that ATP was doing nothing wrong. In fact, it was doing nothing. The error occurred even when a WRITE statement began execution, and this was followed immediately by a PAUSE statement. Clearly, the handling of parameters could have nothing to do with the trouble since they were not even being used this early in execution. With no one else to blame, your Editor suddenly had an inspiration: why not blame Bill G? Your Editor suggested rebooting the computer, although nothing this drastic was required. After ending the various other processes (icons), the DOS window was closed and reopened. Thereafter, Mingw32 ATP behaved normally.

New EEUG List Server

Inconsistent dates of E-mail from the Web form were mentioned in the April issue. Following his pre-publication review, Laszlo Prikler explained details in E-mail dated February 25th: *"I looked into the script. The date(s) and time(s) you see in the e-mail and on the signed HTML form come from different sources. 'Form submission date and time' that you see in the BODY of the e-mail and at the top of the HTML form ... are the only legitimate ones because they come from a server side 'localtime (time)' call. This is the date/time when the script processed the HTML form. 'Local' here means the server time ... The other two dates and times that you see in the e-mail and on the printed Web form are out of our control."* Prof. Prikler went on to detail these. Obviously, no one but the user controls what he keys for *"Date_of_request. … 2111.13.32 is what I entered earlier today in the test form I sent to you."* Yes, no software objected to this illegal date. About the *"Date:"* line of the E-mail header: *"The atplicfm.pl script does* ***not*** *assign any value … The 'Date:' information originates from either the 'sendmail' program on the Unix host or from a mail server along the delivery route."*

Dan Durbak of PTI was inadvertently disconnected from the EEUG list server as explained by Michael Havekost in E-mail dated April 27th: *"I took Mr. Durbak from the list because I got a huge amount of bounced E-mails from his E-mail server. The problem with Listserv's auto-delete feature is that it cannot recognize all kinds of permanent errors. If a host server sends a non-standard error message, the auto-delete function will not take care of it, and consequently nothing happens --- except that I receive error messages forever. This was the case with Mr. Durbak, so I had to take action."* Four days earlier, your Editor had speculated that those famous PTI aliases might be involved (see mention in the preceding issue). Mr. Havekost did not say *no*. As for a solution, he agreed with the earlier advice of EEUG Deputy Chairman Prikler, who had suggested: *"The simplest way would be to fill a new on-line license form ..."* About that auto-delete feature, see the paragraph about *"subscription probe"* in the July, 2001, issue. In response to this incident, your Editor once again was prompted to question the basic concept of mass mailing. About bounced list server mail such as Dan Durbak's, your Editor wrote the following on April 28th:

"Yes, and as the size of the list grows toward infinity, this becomes a flood. I believe you have identified another of the natural limits of a list server. Eventually, I suspect we might want to consider an interactive alternative to mass mailing. The one really big discussion forum in which I participate is run by Morningstar (www.morningstar.com). 'Vanguard Diehards' is by far the largest group, and it does not involve E-mail. Instead, notices must either be read or contributed via interactive connection. Why do we instead use E-mail? Because Bruce Mork began with a list server a decade ago? Then, use of E-mail was natural enough. The Web (WWW) may have existed at that time, but I am not sure any of us knew anything about it. Harald Wehrend in Hannover was one of the very early users, as I observed in the October, 1994, newsletter. If today we were to begin a new discussion forum starting from nothing, would we rely upon E-mail? It would not be my recommendation, precisely because growth makes a list server increasingly difficult to manage. Bounced mail and 'out of office' messages are problems of E-mail, not of interactive connection."

Relevance to ATP is required by list server rules, readers are reminded. Failure to connect writing to ATP is a common reason for rejection of contributions. One such case occurred May 17th, when EEUG Deputy Chairman Laszlo Prikler efficiently performed his duty as a moderator as follows: *"Your posting to the ATP-EMTP-L mailing list can not be accepted for distribution because: 1) It is not an ATP-EMTP related question. It involves transients and raises an interesting engineering problem, but it has no connection with the electromagnetic simulation program ATP. 2) Incomplete affiliation at the end of the message. Please read the list operation / moderation rules at http://www.emtp.org"* The author was not happy with this judgment, it would seem. May 22nd, he protested: *"What purpose does it serve just to be just concerned about a tool i.e. ATP? Aren't we more interested in what it does for us i.e. answers on transient related questions? I apologize & very humbly totally disagree with your response. I know that my this note is NOT going to change your stance. But someone has to speak out. Regarding '2) Incomplete affiliation at the end of the message,' what am I supposed to do? Please help."* The following day, your Editor responded: *"Since Laszlo handled your first attempt on Friday, I guess it now is my turn ... This service is not* ***just*** *concerned with ATP. But explicit ATP involvement is required."* About *"very humbly totally disagree,"* your Editor wrote: *"Well, if and when you ever operate your own free service for others, you should be able to impose your own rules regarding its use. Good luck."* About *"someone has to speak out,"* your Editor wrote: *"It never ceases to amaze me how demanding some subscribers can be. ... It did not occur to you that there might be rules about use of the list server? You object to Laszlo's adherence to rules even though you did not bother to read what they were? Connect to ..."* Also, your Editor mentioned another dissatisfied customer: *"Your message will provide a nice continuation to the paragraph about that ... professor who wanted to advertise his publication using this list server."* See *"the January, 2001, newsletter. The paragraph begins 'Rejection of advertising ...' Like you, he found our rules quite unreasonable, I guess."* Once again, the conclusion is this: the need for moderation continues to be demonstrated on a daily basis.

The Middle East still does not have an ATP user group, although one proposal was discussed in the January, 2001, issue. A quick search reveals that the MEUG story began in the April and October, 2000, issues. Your Editor had asked several questions (e.g., about Arabic-language E-mail), and still has not received any answers. But the most important question of all was the one nobody bothered asking. It was: who licensed your use of ATP materials in Egypt? The answer, discovered by Prof. Laszlo Prikler and your Editor on January 4th, seemed to be: no one. At the time of the public discussion, Dr. Eissa was a subscriber of the Fargo list server, recall. But Prof. Bruce Mork was operating without security. Although his rules prominently required ATP licensing, Prof. Mork relied upon each subscriber for compliance. The result was predictable. In addition to occasional recognizable subscribers from organizations that had participated in EMTP commerce (e.g., DCG, EPRI, and its partners and contractors), a substantial number of hidden, unlicensed subscribers always had been suspected by your Editor. Well, Dr. Eissa would seem to represent a prominent example. Helwan University was mentioned in the April, 2000, writing, yet no trace of either this name or "Eissa" was found in either Can/Am or EEUG licensing. Note the importance of the tightening of security on 30 November 2000. This disconnected unlicensed users from their familiar source of ATP information. Eventually, a typical user of old ATP materials would encounter some problem that he could not solve by himself, and would be forced to seek help. Dr. Eissa did this in E-mail to Prof. Laszlo Prikler dated December 31st. Following your Editor's message of January 4th (in effect, *"sorry, no license here, either"*), Dr. Eissa wrote on January 6th: *"... since this time I have lost my mail address that was listed and I have been fully busy to follow a new one. I would ask once more to be listed in the ATP for a new address ... Could you please help me as soon as you could in this matter."* Your Editor was not impressed, particularly by the attachment and the need for speed: *"Attachments to E-mail are irrelevant. We asked for none, and have no idea what to do with one. Licensing does not involve any attachment. ... Recall what I wrote to Laszlo: 'An absolute requirement is this: we send valuable ATP information only to an E-mail address for which we have a signed license.' Here 'signed' means using a pen on a piece of paper. We need the original signed paper, so typically this requires snail mail."* Privately, to Prof. Prikler, your Editor concluded : *"At the same time this person wanted the authority to license others, and distribute ATP materials, he himself was unlicensed, and was using the Fargo list server in violation of this requirement? Amazing. This looks like yet another example of what was wrong with Prof. Mork's operation. Security of the EEUG list server was long overdue."*

Estimate Actual Table Sizes

ESTIMATE ACTUAL TABLE SIZES (EATS) was the dominant subject of work during several weeks that began one week before the Memorial Day weekend, which now always falls on a Monday rather than the historic May 30th. Great progress has been made since the preceding appearance of this same story in the April issue.

RUNEATS.BAT serves to test EATS using standard test cases. It began as a copy of RUN.BAT but with a PAUSE statement in the middle. Preceding this are the lines of execution that are known to produce correct results. The resulting .LIS files are preserved as *.EAT for easy comparison following **Ctrl-Break** at the PAUSE. Below the PAUSE are lines of execution that either produce wrong results, or have not yet been tested. As this story is being written June 10th, there are 34 successful tests: DC-1 through 12, 16, 18-24, 30-35, 37-38, 40, 49, 63, DCNEW-1, 2 and 4. At the start of RUNEATS, STARTUP.EAT is copied on top of STARTUP to apply a minus sign to FLZERO as mentioned in the April issue.

$STARTUP is illustrated by DC-37, and this collided with testing of implied EATS until the problem was understood. If execution had simply died, the trouble probably would have been understood quickly enough. But this is not what happened when only STARTUP had been modified to request EATS testing. Approximately one full subcase was missing from the output. Eventually it was realized that more than just a positive FLZERO was the problem. Loss of the exceptional NOCALC = 1 and LU6VRT = 0 also had an effect. The bottom line is this: changing STARTUP parameters in the middle of execution always has been potentially tricky; there may be unintended consequences. Beginning June 9th, the discontinuity was avoided. RUNEATS.BAT now copies STARTUP.EAT into DC37STAR.DAT as well as STARTUP. This is at the beginning. Upon completion, the original two files are restored.

KNTSUB is a new counter of subcases that will be displayed on the screen (but not in any .LIS file) if DISK (but not BOTH) is used with stacked subcases. The idea is simple: whether or not EATS is involved, the subcase number is a very important statistic for the 2nd or later subcases --- particularly as more and more of these are stacked higher and higher. For a single subcase, no such extra output is required or desired since the user of DISK knows that execution is underway. It is just as the 2nd or later subcase has begun that this important progress (start of a new subcase) will be reported to the screen. If there is no EATS use, this is simple. For example, DC-4 has two subcases, so when the 2nd of these begins, the following will be seen on the screen:

```
----  Begin next subcase number KNTSUB = 2
```

As the number of subcases increases substantially (e.g., DCNEW-28 has 78), this statistic may be extremely useful. Of course, the monitoring of slow progress (using less-powerful computers) is important. But more important might be this detail: if execution might die, the user will know where. Note that location might not be obvious from the .LIS file if this output is being buffered substantially.

KNTSUB also is written to the screen during DISK in the case of EATS use. However, details depend on additional parameters. First, there is the question of whether or not STARTUP has ordered implicit use. Second, there is the location of the use (whether it is in the first subcase). Third, there is the question of whether NEW LIST SIZES (NLS) is involved. No, there are not 2**3 = 8 variations, but there are several as documented at the end of DC-22 (an illustration of NLS data) and DCNEW-2 (an illustration of explicit EATS data). To illustrate the simplest case, consider new DC-4 output with EATS ordered implicitly from STARTUP :

```
----  Begin EATS for subcase number KNTSUB = 1
----  Begin EATS for subcase number KNTSUB = 2
```

For the other possibilities, see DC-22 and DCNEW-2.

DC-17 has a $LISTOFF declaration that made the special EATS output invisible prior to added definition of NOUTPR in SUBR1 on June 14th. If EATS is being ordered from STARTUP (implicit use), the associated output is believed to be important enough that it always should be seen. Except for the special EATS output, however, $LISTOFF remains in effect.

GNU ATP Installation Dependence

Text of CABLE PARAMETERS (CP) was overhauled April 27th. If any GNU ATP user notes that most CP labeling is wrong, he is advised to acquire a compatible blockd51.bin text file. Why was the work done? During the summer of 1995, Kwang-chien indexed CP text to SUBR27, which finished with a staggering total of 152 messages. Since then, CP code had been off-loaded into NEWCBL because the disk file had become too large to edit using real MS-DOS. Finally (a year or two later), text has followed. Also, text generally has been distributed among the modules of use (CBLPRE, ZYMX, etc.) . SUBR27 still has many messages, but at least the count has been reduced to a more manageable number (64). Because vector KENFNT overflowed, the limiting number of modules was expanded from 118 to 128.

Text of branch data input similarly was overhauled April 28th through the 30th. If any user has the wrong external text file, most likely he will not need to wait for CP use (see preceding paragraph) to discover the mistake.

Program text has been external during recent years because the GNU FORTRAN compiler g77 had trouble handling the single, enormous BLOCK DATA module that is used with other compilers. A good summary can be found in the January, 2000, issue. See the paragraph that

begins *"Text remains external ..."* The following paragraph explains that *"Program text could be made internal by splitting the BLOCK DATA module into 3 or 4 pieces."* But this was only a test *"because improvement was small."* That was using g77 --- all your Editor ever considered. But why not use GNU C instead of FORTRAN? This was the idea of Orlando Hevia of UTN in Santa Fe, Argentina. His E-mail dated June 20th explained: *"I have been using LUNTEX = -11 for about a year without trouble. I added a subroutine to my OVER51NY program --- renamed MUP2BIN --- to generate both BLOCKD51.BIN and BLOCKD51.C at the same time. The latter of these can be compiled in a short time (taking into account the size of 2.6 Mbytes). The resulting TPBIG after Aspack is smaller ... and it is perhaps 1 or 2% quicker, too. The .C subroutine includes a dummy READ112 to force the inclusion of BLOCKD51.O when it is embedded in library TPBIG.A Because BLOCKD51.O involves BLOCK DATA, it would not be included if this were not forced by the READ112 call. The changes to GNUMODS.F are minimal."* Since C already is used for other GNU ATP functions, there is no compelling reason to refuse its use for text. The 1.44 Mbyte limit of floppy disks originally was an objection, but this is circumvented by Aspack (see the July issue). Mr. Hevia wrote : *"With text on the inside, ... TPBIG.EXE after Aspack has size 1,193,472 bytes . "*

ATP Licensing Problems

IREQ / Hydro-Quebec is a DCG member, so is **not** eligible for free access to ATP materials in the absence of an ATP pardon. This has been explained in more than one newsletter, with the most complete summary being a story in the July, 1995, issue. But what about related companies and their foreign extensions such as *"Hydro Québec International Sucursal del Perú"* (the name seen in licensing E-mail dated March 7th) ? The declared location is Arequipa, Peru, and the applicant's name is said to be Ricardo Quijada. On the other hand, no signed paper copy ever was received by snail mail, so perhaps the applicant later realized the potential conflict with free ATP licensing.

RTDS Technologies, Inc. in Winnipeg, Manitoba, Canada, has not been mentioned explicitly in preceding newsletters. However, it comes from the same city as EMTDC, and was linked to EMTDC in E-mail of the former Fargo list server. The first reference to RTDS was located by your Editor in a semi-public message dated 29 March 1994. In this, N. R. Watson wrote the following from New Zealand: *"More information on the real time digital TNA. A new company has been formed in Winnipeg to market and manufacture digital TNA's. It is known as 'RTDS Technologies Inc.' who license the technology from the Manitoba HVDC Research Centre. ... The digital TNA in Winnipeg is a specifically designed parallel processor built around the emtp algorithm."* Your Editor himself mentioned RTDS briefly in a list server message dated 28 June 1996. The title of this was: *"EMTP and EMTDC --- some more thoughts."* Finally, there was a message from Messrs. Pereira, Sarcinelli, and Rodrigues of Furnas in Rio de Janeiro, Brazil: Dated 2 July 1996, this lengthy explanation treated various details including acquisition: *"During the discussions for the acquisition of the RTDS it was offered to Furnas the EMTDC ... The EMTDC has been used for more than a year and the RTDS has been commissioned just two weeks ago."* So why the renewed interest in RTDS? March 5th, a license application for free ATP use was received by E-mail from yzhang@rtds.com in Winnipeg. The name of the applicant was Yi Zhang. Without difficulty, your Editor connected to www.rtds.com on March 5th, and learned that *"RTDS Simulator performs ... fully digital Electromagnetic Transient Power System Simulation in real time utilizing the Dommel Algorithm similar to non-real time emtp type programs."* That does sound like EMTP-like simulation, all right. A difference from the EMTP commerce of others would seem to be this: hardware typically is sold along with the software --- hardware that allows real-time simulation.

Doble Engineering of suburban Boston was mentioned in the July issue. At the time (December, 2001), Doble was not suspected of possible involvement in EMTP commerce (which would prevent free licensing using the standard form). Such suspicion was received by E-mail dated March 21st, however. In this, a contact who prefers to remain anonymous explained: *"On page 4 of the Winter 2002 issue of the 'Centre Journal,' which is the bulletin of the Manitoba HVDC Research Centre, I read the following: 'Doble Engineering Company of Massachusetts, USA has recently signed an agreement with the Manitoba HVDC Research Centre to promote and distribute PSCAD / Relay to the Protection Engineering community. PSCAD / Relay is a power system simulation program ideally suited for protection engineers and technologists. PSCAD / Relay is used to create accurate full time domain transient (COMTRADE) test waveforms.' ... The Journal is available electronically at www.hvdc.ca/news.html"*

Power Company Politics and Religion

Personal use of the Internet by BPA employees was mentioned in the January, 2002, issue. The struggle between theory (government facilities are to be used only for official business) and practice (widespread personal use on personal time) continues. A surprisingly open documentation of the conflict was noted in E-mail *"From: Haner, John - TOM-PPO2-2."* This mass mailing dated May 1st had *"Subject: Internet Personal Use."* New BPA manager Haner explained his own confusion, and he documented monitoring: *"I reminded the people giving this class that I was told by them 6 weeks ago that it is legal to*

use the Internet for personal use so long as: 1) It is done on your lunch or coffee break. 2) Inappropriate sites (porno, militant, offensive to onlookers, etc.) were not visited. 3) No downloading of personal E-mail accounts (hotmail, attbi, etc.). I told them that I personally read the USA Today site at lunch to get the news based upon the direction provided by their own staff. They told me to 'stop.' I was told the rule is a result … not of inappropriate behavior, but … heightened security from the 9/11 events. Until I can get a ruling ... be advised that no one seems to know the rule for sure, but they have no problem sending out letters counseling you to stop. If anyone in TOM receives one of these letters, please let me know as I intend to question it with this staff. REMEMBER HOWEVER, our computers are monitored. Every site visited is known and every minute spent on the Internet record able." Yes, George Orwell's *Big Brother* (see mention elsewhere in this issue) would be proud.

The load flow program that is recommended for use at BPA has changed once again. For the 3rd time in less than 7.5 years, the management of System Planning has changed its mind. Recall the January, 2000, issue had a paragraph about *"the great August, 1996, blackout on the West Coast."* The summary ended with a guess about the transient stability program that was **not** used for the investigation: *"not the one currently recommended by BPA management!"* Historically, transient stability always has been paired with load flow, and beginning in December of 1994, PTI's PSS/E was management's recommendation. Next came Dr. John Undrill's programs. During recent years, these have been sold under the G.E. name, and had been selected by WSCC. Now another change: a separate decision about load flow as documented in E-mail from BPA's John Haner. Dated May 15th, this has *"Subject: Decision -- Power flow analysis tool."* It begins with a few words that summarize use today: *"Presently we are using IPF, PowerWorld, PTI, and GE, depending on the user and specific need."* This was reality, if not management's earlier desire. For the future, the official word is this: *"We have come to the decision that the TBL power flow analysis tool will be PowerWorld. While there are specific benefits to each of the tools (and combination of tools) evaluated, PowerWorld was determined as the one best suited for the TBL standard."* Meetings were scheduled to convey *"plans for transition to this tool."* For readers who are unfamiliar, IPF indicates BPA's own Interactive Power Flow program, and PowerWorld comes from www.powerworld.com

Solar power is much more costly than wind power. The latter is bad enough (see mention of a 1.7 cents/kWh federal subsidy in the July issue). In the May 31st edition of *Hot Issues*, BPA management proudly reports on dedication of *"the Northwest's largest solar electric generator on May 30. The solar station has the capability to provide for the non-space-heating electric needs of approximately 16 residences at a cost of about 25 cents per kilowatthour."* What this means is unclear, however, because the heavy demands of water heating and cooking could be, but are not necessarily, electric. Presumably maximum output is feeble, indeed, and occurs only at high noon on a clear day. The politics are obvious. Meanwhile, your Editor continued to pay just under 7 cents / kWh (the incremental rate) to heat and light his own apartment during the month of March.

Possible printing of money by governments in order to pay their bills was mentioned in the July issue. Orlando Hevia confirmed the problem in his financially-troubled Argentina. From E-mail dated May 19th : *"Oh, yes. The government here had planned to print 3200 Mpesos for the entire year 2002. We are not yet half way through the year, although 3800 Mpesos already have been printed."*

"Science board says proof lacking" is the title of a short paragraph in the June 14th issue of BPA's *Hot Issues*. It illustrates well how *science* of the previous administration no longer is accepted on faith now that Clinton and Gore are out of power. Recall how your Editor referred to *"BPA's wacko environmentalists"* (see the January, 1998, issue) who were happily wasting massive sums of rate-payer money (roughly $400 million/year) on fish. An important part of this was the spilling of water over the tops of dams rather than sending it through turbines to generate electricity (see the July, 1994, issue). Finally, years later, this waste has been successfully challenged scientifically. Proof of what was lacking? According to the BPA summary, proof *"that flow augmentation increases fish survival. A report from the Independent Scientific Advisory Board released June 4 found no comprehensive studies to support a relationship between increased flows in the river system and higher survival rates for migrating juvenile salmon."* This was a *"review for the Northwest Power Planning Council in response to an earlier report that reached the same conclusion. The science board further said that the National Marine Fisheries Service 2000 Biological Opinion provides no quantitative analysis on survival benefits that would result from its requirements for flow augmentation."* Of course, Clinton and Gore controlled NMFS policy during the entire year 2000, when Gore's junk science was an article of faith. Amazing. A final explanation might be about the former Vice President. Normally, the opinion of a Vice President carries negligible weight. After all, a President wields the power; a Vice President is just waiting for the President to die (most recently, it worked for Lyndon Johnson) or resign (it worked for Gerald Ford), or reach the 8-year constitutional limit to his power (the most common termination). But Bill Clinton was exceptional. For some unknown (to your Editor, anyway) reason, Clinton generally left environmental policy to Al Gore, and this is why both names usually are mentioned as a pair when Clinton's environmental policy is being discussed.

"FERC pushes standard market design" is the title of a story in the August 2nd issue of *Hot Issues*, which is BPA's online newsletter. The subtitle is *"Some in West say it's a power grab."* As mentioned in the April, 2000, issue, *"FERC provides oversight and regulation of the American power grid from the nation's capitol in Washington, D.C."*

BPA's summary of FERC's latest initiative is this: *"The time is ripe to move forward on establishing market standards as a new foundation for bulk power markets, according to the Federal Energy Regulatory Commission. In what some have described as its biggest rulemaking ever, FERC adopted its Notice of Proposed Rulemaking on Standard Market Design at its July 31 meeting. The proposal, FERC says, is aimed at preventing a repeat of the California energy crisis and subsequent market manipulation. FERC says the standards will eliminate a patchwork quilt of inefficient regulation throughout the nation and provide clear, standardized rules and vigilant oversight of wholesale power markets. ... the goal is to promote economic efficiency through solid infrastructure, reasonable rates and balanced market rules that provide stability."* Sounds great, eh? If federal regulators only exercised more power, consumers across the land would live happily ever after. Well, *"The controversy began immediately, especially in the West ... Many Western critics, including state regulators ... called it a power grab and expressed fear that FERC is ignoring the West's uniqueness by imposing an East Coast model on the entire nation. ... 18 utility commissioners from 15 states ... signed a joint statement criticizing FERC's proposal. The commissioners said decisions about buying and selling electricity for consumers should be left to those who know their systems best."* A spokesman concluded: *"FERC is subjecting our consumers and economy to a reckless experiment."* Well, no doubt. Remember, FERC approved rather than opposed the disastrous experimentation in California. Anyway, it would appear that BPA's hope for an RTO (see the April, 2000, issue) has been delayed once again, and overtaken by events out of its control. *"FERC delays rule on RTOs in West"* is the title of another story in the same issue of BPA's newsletter.

Vector Plots of JMARTI Fitting

The preceding issue contained a plot of JMARTI fitting, although there was not enough room to document any of the several interesting details associated with this display. First, and most important, color has been lost. This was the big surprise and disappointment. Color was seen on the screen during the fitting, of course, and it also was seen after the HP-GL had been passed into WP 9. Finally, it was seen using MS Word to display the export from WP 9. But the printing as a PostScript file, followed by the application of Adobe Distiller, resulted in monochrome (shades of gray) PDF output. Yet, using the same procedure, color was preserved for that screen plot of DC-18 in the January, 2000, issue. Probably the printer is different (printers are always changing), but why trouble now? The only other known difference is the use of HP-GL instead of a DISLIN bitmap. Needless to say, the high resolution and compact size of HP-GL are preferred. But at the expense of loss of color? Does any reader understand how color might be recovered? If so, please advise. The bold pens are another curious detail of the plot. Some sort of WP 9 default seems to have caused this, and neither your Editor nor Dr. Liu bothered to learn how to make the drawing finer. For a JMarti fit, there generally is no need because curves vary slowly. That 4th subcase of DCNEW-3 involves a 6-phase line and SPECIAL DOUBLE CIRCUIT TRANSPOSED . The 1st mode was selected precisely because it is less boring than modes of an average 3-phase line. Cables, too, have been known to produce interesting plots. Yet, the JMARTI fitter always seems to do its job well --- because the curves are both simple and smooth. Even with fine pens (not used by WP 9 for the red curve, unfortunately), the two curves are nearly indistinguishable. Resulting branch cards might be lacking because of the constant transformation matrix [T] that is required, but this appears to be the only significant source of error. Color screen plots clearly show that the JMarti fitter typically does its job well. Why? Because the theoretical curves produced by LINE CONSTANTS or CABLE CONSTANTS / PARAMETERS are smooth.

Laszlo Prikler, the Deputy EEUG Chairman, was the first to respond to Adobe Distiller's loss of color using PostScript. In E-mail dated June 10th, he advised: *"Your Distiller is probably outdated. What do you see when you start Distiller manually? Mine shows this ... If you right click on the Distiller 'printer' on the Control Panel | Printers (or Start | Settings | Printers) and select Properties you can manipulate the Postscript settings there. Default setting is Adobe Postscript (as above), but you can chose another PS driver if you have one. If you have not, you can download one from HP. I made extensive testing with these and HP Color LaserJet 5/5M PS was found to be the best."* This was in response to the PDF copy of the July newsletter that your Editor had sent to Budapest and Osaka for storage on the Internet by EEUG and JAUG. Regarding announced availability to others, Prof. Prikler concluded: *"I see Dr. Funaki's message in the Listserver queue for approval. I will OK it within a minute. Of course, the July 2002 issue is already in EEUG storage, as well."*

Dr. Tsu-huei Liu surprised your Editor by producing a color plot in a PDF copy of the July newsletter. When she left for the day on June 28th, Adobe Acrobat Reader was displaying the JMARTI plot in color. Unfortunately, the font had changed: an unwanted, extra page 21 was required for some 20 excess lines. Also, there was an obvious problem with file size. DOS DIR showed 182 Kbytes for the original file whereas her new one in f:\atp had bloated to 624 Kbytes. July 2nd, Dr. Liu explained that her color .PDF file had been produced directly by WP 9. She bypassed the usual PostScript printing followed by the use of Adobe Distiller. Instead, she took the MS Word disk file JUL02.DOC into WP 9 and outputted it directly as a PDF file. About file size, both good news and bad news was learned. Apparently WP 9 does not compress as Adobe Acrobat did, so PKZIP offered some hope. However, it did not make enough difference for the procedure to be practical: the 624 Kbytes was reduced to 429 Kbytes.

Hoidalen Improves ATPDRAW

Pictures of nonlinearities dominant the news about ATPDraw as announced March 11th in E-mail of the EEUG list server. Deputy EEUG Chairman Laszlo Prikler began: *"ATPDraw version 3.3 is now available for licensed ATP users via the secure EEUG web site ..."* Following this was the usual summary of improvements: *"Next comes Dr. Hans. Kr. Hoidalen's announcement about the new features, bug fixes etc. 1) The nonlinear characteristic of all components can be plotted for visualization and copied to the Windows clipboard. 2) More flexible handling of nonlinear characteristics that includes copying between components and pasting in from a text file (16 char. fixed columns used). 3) Support of special editions of nonlinear inductors type 93, 96 and 96 with initial conditions and built-in flux-linked calculation."* Of course, ATPDraw author Hoidalen is an Associate Professor at the Norwegian University of Science and Technology in Trondheim.

"Important: The user does not need to specify names for every node in ATPDraw!! Specify only a name for the important nodes. These will then turn black ... ATPDraw will take care of naming the nodes connected together automatically. In fact the user does not need to specify any node names at all! ... If the user specifies a name for every node, the risk of mistyping is significant." This was the advice of ATPDraw author Hans Hoidalen in E-mail of the EEUG list server dated March 22nd. It was the end of a discussion that began with a complaint about recent changes. The preceding day, Dr. Mike Ennis of S&C Electric in Chicago had observed: *"one doesn't appear able to enter component nodes in the component dialogue box. Rather one has to click on the nodes themselves. Is this intentional, and what is the benefit of this?"* Then came an established user who confirmed Dr. Ennis's complaint. Dr. Keith Walshe of Power Quality Technologies in Sydney, Australia, explained: *"One of the benefits of adding names via the component dialogue box was that when a system is being developed and node interconnections change, it is not necessary to visit every node and rename."* Deputy EEUG Chairman Laszlo Prikler quickly recognized the different practice: *"Normally, I deal with only some percent of nodes ... I need human-readable names only for nodes having some importance ... All the other names are left blank and ATPDraw will assign a name when the .ATP file is created."* Yes, your Editor (not a user) always had assumed that ATPDraw would name most network nodes for the user, but some users seem to have been naming all nodes manually. Manual naming does have the advantage of stability and readability of the output data cards. Each name given by the user will remain fixed whereas ATPDraw-supplied names will not, if the network is changed. The tradeoffs involved are interesting. Prof. Hoidalen's observation about possible mistakes keying node names certainly is valid. On the other hand, if your Editor were investigating unexpected trouble during subsequent ATP execution, he might find manually-given names easier to work with. Certainly before ATPDraw, users typically assigned meaningful node names wherever possible as demonstrated by most standard test cases. For example, name LMA indicates phase "a" of BPA's 500-kV bus named Lower Monumental in DCNEW-4.

Creative ATP Modeling

Overflow of the original limit of 99 dummy arguments of DATA BASE MODULE (DBM) was eliminated by the "NONDUM =" declaration as summarized in the October, 2001, issue. Recall the original complaint came from Dr. Michael Steurer of CAPS at Florida State University in Tallahassee. Well, another person apparently needing such relief was Mike Staihar of the University of Idaho in Moscow. In E-mail dated February 18th, he explained his need as follows: *"I am working with Prof. Brian Johnson ... The component that I'm building a model for with ATP is a 16 samples-per-cycle digital cosine filter for an ATP protection relay model. This model will be used in a U.S. Navy power systems project. This single $INCLUDE file for a filter requires 112 dummy TACS variables. I have to use dummy TACS variables because this $INCLUDE file is used 4 times in my power system model. In the near future I will be making an ATP model of a 32 samples-per-cycle digital cosine filter which will require over 220 dummy variables per $INCLUDE file. A 64 samples-per-cycle filter is also a possibility and would require in excess of 400 dummy variables."*

CALL DEPEND is a new mandatory transfer at the start of ATP execution beginning July 11th. If the user does nothing special, DEPEND will be a new dummy ENTRY point of SUBROUTINE ANALYT which might be user-supplied. February 8th, your Editor had written the following to Stefano Malgarotti of CESI about the proposed unification of ATP and LIOV: *"Not so simple is the issue of which program to leave as the main program. If you have 2, only one can be the main program if you plan to link them together. Note that if you used standard GNU materials, you would need to convert the LIOV main program to a SUBROUTINE, and call it from ANALYT or some other interface module that you are given. I should think about an alternative standard location near the beginning of execution. Why not (the idea is independent of LIOV; this would be an extension to the standard interface)? On the other hand, if you used event flags (semaphores), both programs could remain separate programs. Execution would be less efficient, but work might be more convenient if you know how to handle the flags."*

Per unit data for the Universal Machine (U.M.) is **not** encouraged. The July, 1997, newsletter summarized a story about confusion using per unit data with the Type-58 or 59 Synchronous Machine (S.M.). The title was *"Inadvertent energization of generators."* The same advice ("don't go

there") now is being extended from S.M. modeling to U.M. modeling. In E-mail of the EEUG list server dated August 5th, Sudeep Pyakuryal at South Dakota State University in Brookings had asked: *"Is anybody willing to discuss with me the modeling of electrical analog of mechanical system associated with universal machine in per unit? I tried different systems in SI, and per unit, and could not find a consistency ... The impression I have developed is that the electrical analog of mechanical system requires a special treatment ..."* Later that same day, Gabor Furst advised as follows from suburban Vancouver, B.C., Canada: *"The problem of using per unit system in ATP simulation was discussed, if my memory serves me right, some years ago. I said then that using per unit data in EMTP simulation is asking for trouble, unless the user is very careful. This is even more so if U.M. simulation is involved with the electrical analogue of the mechanical system. I would hate to have the task to re-scale the inertia and viscous damping inputs for the specific per unit system used. My best advice, particularly to not-very-experienced ATP users, is to use the S.I. units and enter the inertia and viscous damping in the electrical analogue exactly as required by the Rule Book. It does work."*

Frequency Scans and Harmonics

One or more voltage outputs was required as part of any frequency scan if output variables involved more than just magnitude. This was the discovery of Orlando Hevia of UTN in Santa Fe, Argentina. In E-mail dated June 14th, he reported: *"I detected a problem using FREQUENCY SCAN when the POLAR or RECTANGULAR or BOTH declaration is used. This is for C-like, C-Pisa, FORMATTED or UNFORMATTED .PL4 output. Only use of the widenn alternative produces correct results."* Mr. Hevia attached a simple illustration, and this was taken as the basis for a new 15th subcase of DCNEW-25 beginning September 16th. The only output is a branch current --- more precisely, all 4 possible parts of the complex (phasor) branch current. Prior to the correction to HEADL4, execution of Salford EMTP died during batch-mode plotting. Technically, the problem was just with plotting, or with the associated .PL4 file. Without plotting, execution was normal. But with plotting, execution died quickly in LODPLT as ATP tried to read more plot data than existed in the disk file.

USRFUN and CIGRE Sources

USRFUN and CIGRE are possible alternative, new declarations to be added to a Type-15 electric-network source card. ATP code for this new modeling, finally installed in the UTPF by your Editor on July 28th, was developed some months earlier by Orlando Hevia of UTN in Santa Fe, Argentina.

The name USRFUN is short for *user function* --- a member of an arbitrary family of functions of time that can be supplied by the user who wants to extend the standard source menu of ATP. Of course, the appropriate compiler is required (once again, the zero GNU price is right). User-defined sources are not new, however. The reader should realize that ANALYTIC SOURCES USAGE (ASU) has allowed a user to define his own sources since the early '70s. Next came Laurent Dube's MODELS interface during the early '90s (the value of a MODELS source could be passed to the electric network easily enough). But a USRFUN source improves substantially the convenience, clarity, and simplicity; and it avoids the execution inefficiency of Dube's MODELS, of course.

One disadvantage of ASU is absence of documentation of the source function being used. For example, comment cards in DC-6 document the ramp up and down. But how does the user know that this is what the code really is providing? Using USRFUN, an arbitrary integer is uniquely associated with each function. If ATP can not match the user's request, an error message will result: *"Halt ... Type-15 USRFUN source has type code ... This has not been defined."* The source integer is like the PIN (Personal Identification Number) of a debit card from a bank (not to be confused with a credit card, which involves quite different risk of theft). Using 32-bit Intel storage, there can be roughly 2.0E+9 different ones (see the story about Jeremy Caplin in the July, 2000, issue), so plenty of security if this is desired. USRFUN sources can be made more secure than your Editor's personal money!

Another advantage of USRFUN compared with ASU is an absence of subscripting in user-supplied FORTRAN. The programmer of ASU needs to map the functions to source numbers, whereas the programmer of USRFUN does not (ATP provides the appropriate connections automatically). This eliminates one possible source of error (unlike ATP, the programmer of ASU might sometime make a mistake). Whereas ASU was easy for a small data case such as DC-6, the burden of indexing might be substantial for data involving many sources. Finally, no COMMON is required for USRFUN, and source data named T-start and T-stop are handled automatically for the user (see the 6th subcase of DC-5 for an illustration of T-stop use).

But what is the price of this user convenience? Whereas ANALYT was called just once per time step, USRFUN will be called once **for each associated source** during each time step. Finally, ANALYT avoided arguments (a burden on execution) whereas USRFUN does not. So USRFUN generally should simulate a little slower. Recall how, during the late '80s, Cray ATP spent too much time in the absolute value function. This was at the University of Illinois, before the function was forced inline. But computers are so darn fast and cheap these days, the average user probably will not know the difference, or care. Also, functions might automatically be inserted in line by a

modern compiler. Your Editor first heard of this from Robert Schultz of the New York City area during the early '90s, and computer expert David Szymanski recognized the concept (*"now that's an idea"*) when it was mentioned to him shortly thereafter. Finally, the user pays for only what he uses. If USRFUN is not used, execution will not be slowed. As a result, concern is minimal.

The CIGRE source function was explained in E-mail from Mr. Hevia dated July 30th: *"It is described in the 'Guide to Procedures for Estimating the Lightning Performance of Transmission Lines' from Study Committee 33 (Overvoltages and Insulation Co-ordination) of CIGRE Working Group 01 (Lightning). It is known as paper or brochure 63. On this subject, I wrote in Spanish a paper for Revista Iberoamericana del ATP (Ibero-American ATP Review). A translation to English is in Laszlo Prikler's hands. Hopefully this will be included in some future issue of EEUG News."*

Symmetrical Component Z0Z1Z2

Interpretation of input data for Z0Z1Z2 involves labels such as `"Positive sequence. Z1 ="` for the positive sequence. Such labels remain unchanged, although the following complex number might well be different. Previously, the imaginary part was inductance in Henries whereas now it correctly is reactance in ohms as implied by the letter Z of the label. As a result, interpretation of the input data of 4 subcases of DCNEW-23 has changed.

The 3rd subcase of DCNEW-22 (DCN22c) was the model from which DCN23l was created. Comment cards within DCN23l explain that *"both MODEL [R][L] and MODEL Z0Z1Z2 are illustrated. There are two identical halves with two identical solutions."* Yes, the two independent solutions were identically wrong. How was this possible? Note that *"the phase-domain matrix data ... was copied from near the end of DCN22.DBG ..."* This is a reference to output of DCN22c, which was wrong. The original error with inductance units was made for compensation, in USERNL of UTPF segment SOLVNL. So this, too, required comparable correction.

DCNEW-22 was enhanced by the addition of new 5th and 6th subcases on April 5th. As documented exhaustively in comments, both line-to-line and single-line-to-ground faults are used to demonstrate correct operation of Type-51, 52, and 53 branches that are defined using symmetrical component data. This provides additional support for the 12th subcase of DCNEW-23 since the peak fault current is confirmed by a separate, independent phasor calculation from Orlando Hevia. Finally, there seems to have been independent confirmation by Dr. Walshe using MathCad.

The coupling between real and imaginary parts of impedance is tricky and counterintuitive. Dr. Walshe provided an eloquent summary in E-mail dated April 2nd: *"The mutually-coupled network is not physically realisable with passive elements ... This can be seen in the cross quadrature correction factors that are applied to both the R and the X matrices under the transform. This creates the resistance terms that have corrections based on reactive ohmic values, and vice versa."* So beware, users! The frequency of sequence impedances is arbitrary, but fixed. If you have sequence impedances at one frequency (e.g., 50 Hz), you can **not** create them at another frequency (e.g., 500 Hz) by scaling the 3 reactances appropriately (e.g., a factor of 10). Scaling must be done in the phase domain, where [R] is fixed by assumption of the model. In the sequence domain, Ro, R1, and R2 are **not** constant. Rather, they depend on frequency even though the phase-domain [R] and [L] are fixed. The sequence values are just a convenience of data input. Internally, ATP stores and uses data in the phase domain, so the resulting simulation should be correct at any frequency.

$PARAMETER and PCVP Loop

A $PARAMETER variable that begins with the letter C sometimes was mishandled prior to correction on July 16th if it was used in the DATA BASE MODULE (DBM) framework. Once again, the first report of trouble came from Orlando Hevia of UTN in Santa Fe, Argentina. His E-mail dated July 10th had *"Subject: A problem with DBM and PCVP."* It explained: *"The pair hcorona.dat and hcoronas.dat runs correctly. The pair xcorona.dat and xcoronas.dat is in trouble. The difference is that xcorona + xcoronas uses the same variable passed as argument more than one time in PCVP. I solved the problem in hcorona + hcoronas by using intermediate local variables. The case is from a question of a user. I don't know whether his corona model is correct."* Investigation was quite a challenge (more than a full day), and it inspired changes to four UTPF segments: SATURA, POCKET, OVER1, and OVER2. Whereas creative user Hevia seems to have avoided the problem by means of intermediate local variables, this should not have been necessary -- and is not necessary after July 10th. Why was the letter C a problem? There was confusion with a comment card, assuming the user did not indent his variable definition within the $PARAMETER block. Rather than a simple check for C in column 1, more sophisticated logic should have been used after $PARAMETER became available 5 or 6 years ago. Perhaps the most surprising detail is that no one noticed (or complained) earlier. Yet, arguments seem to have been required, and the combination of $PARAMETER and arguments probably is rare. DBM and $INCLUDE typically are not involved, for $PARAMETER variables.

A PCVP loop over simulation might need to flush plot points from RAM to disk (the .PL4 file) during each simulation. Typically the buffer of size List 31 is 230K or

240K words, and this might fill before T-max is reached. Prior to a simple addition to MNTINC on August 3rd, the flushing failed during the 2nd pass as first pointed out by Luke Hasemeier of Michigan Tech in Houghton. In addition to understanding of avoidance, his E-mail dated July 31st documented the unexpected and unwanted output: *"+++ Time-sharing disabled. Send user-keyed interrupt to silence alarm. Audible alarm began at 31-Jul-02 10:27:07 10 bells."* This was *"using Mingw32 ATP, batch mode processing."* Your Editor investigated using Salford, and found that it exhibited even worse symptoms. The audible alarm is installation-dependent, and Salford ATP began an obnoxious, continuous tone at this point --- all because your Editor had not reinitialized MFLUSH properly at the end of each PCVP pass. Following the change to MNTINC, ATP terminated normally, and DIR CAP.* showed 6 .PL4 files with each having size 1441 Kbytes. About records, Mr. Hasemeier's original data was named XMFR_CAP but your Editor had wanted a simpler file name and more compact data. NORUN = 1 removed "/"-card sorting and it also deleted comment cards.

Cross - Sections of Cables and Lines

KROSEC is the ternary switch that requests a plot of the cross-sections of lines and cables as first explained in the July issue. Originally and previously dimensioned for a maximum of 40 conductors, this feature was variably-dimensioned on August 2nd. Main module KRPLOT remains, but now it CALLs new KRSUBR to allocate Orlando Hevia's 5 square arrays. These are arguments of the subroutine along with maximum number of conductors LV which is the square root of the smallest of Lists 8 (LPAST), 19 (LTACST), 20 (LFSEM), and 28 (LRTACS). Even for relatively-small, 3-times-default dimensioning, there is more space than the average user ever will need: LFSEM = 2580 corresponds to 50 conductors. Using limiting LISTSIZE.BPA, List 20 again is the bottleneck; but a value of 100K corresponds to a never-reachable 316 conductors. In addition to the square arrays, there are 9 vectors, and these have been moved to DECK10. This had the advantage of eliminating four DIBDUC arguments.

Value 2 for KROSEC serves to process input data for no purpose other than Orlando Hevia's plots of the cross-sections of lines or cables. Prior to restructuring on August 4th, this worked for only the first subcase of the disk file. For data involving many stacked subcases (e.g., DC-28), a plot of only the first was seen. Another annoying detail was this: no .LIS file was being created in parallel with the data file name. All other modes of RUNTP execution produce a .LIS file in parallel with the data file (although possibly in a different directory), so why not this one? After all, as originally defined, DISK or BOTH is supposed to produce a disk file. So, there always had been reason to change, and this became compelling following variable-dimensioning of the code. Needed table sizes were not yet available where OVER1 called KRPLOT. So, the CALL was delayed; it was transferred to SUBR1 and this automatically supplied both the missing .LIS file and required table sizes. The .DBG file, too, was created at the same time, and this might be important in case of some error during execution. A final advantage was the naming of the .PS file for PostScript output, Yet another reform the same morning was the replacement of reliance upon CIMAGE within CIMAOH by DIMAGE as created for EATS. This has the advantage of ignoring $PUNCH requests, which previously had produced extraneous headings for non-existent punched cards. It is possible that some better-customized discrimination among $-cards later might be deemed desirable. But for the moment, the $-card logic of EATS seems to serve adequately the needs or Mr. Hevia's line / cable plotting.

Should standard test cases DC*.DAT illustrate plots of lines and cables? When searched, no such use could be found, and this seemed to be both a disadvantage and an oversight. So, August 2nd, $DEPOSIT was added to define KROSEC = 1 at the start of the first subcase of DC-27. Together with cancellation following the first blank card, this produced one representative cross section of one cable (see figure above), which seemed reasonable. But such use was removed by commenting 2 days later when it was realized that there was a conflict with value 2, should the user define this in the STARTUP file. Instead of isolated verification, the thinking now is that KROSEC = 1 should be made a part of standard test case verification.

Partial Table Dumping (PTD)

The Watcom compiler treats a vector of length zero strangely. Rather than length zero, a vector of zero length seems to have a very large positive length. This was discovered in Robert Schultz's TAP_DWRITE and TAP_IWRITE when the second argument (the vector length) is zero. Of course, Schultz always used positive lengths (the program limits), so he never was troubled by the treatment. But when a subroutine was CALL-ed with zero length, execution died in the middle of a very long diagnostic WRITE of the entire vector (your Editor had turned on diagnostic printout). This was noted for DC-9, 37, etc. --- data cases that did not use some modeling (in this case, lumped elements of List 3, which your Editor had not yet exempted from possible handling). After a pause of several seconds, execution ended with the Watcom message: *"*ERR* CP-01 program abnormally terminated."* So, September 1st, protection against zero length was added. About the diagnostic file, consider DCN28.DBG which was inspected using Vernon Buerg's freeware LIST. This great utility refused to advance past line 232137. It issued the complaint: *"File is too large!"* Yes, it was. DIR showed just under 70 Mbytes --- nearly all produced by trying to WRITE a vector of zero length. Amazing.

Another peculiarity of the Watcom compiler was mishandling of the variable TRASH when used as the first argument of CALL COPYA (copy alphanumeric). Your Editor had forgotten to declare and EQUIVALENCE this variable at the top of TABLES when he moved ZTURBO from TAPSAV. Once again, Salford EMTP tolerated the error --- copying real garbage (a numeric zero), presumably --- whereas Watcom ATP died. Yet, the argument mismatch (numeric vs. character) was not intended, so once the mismatch was realized, the trouble was removed quickly and easily enough on September 1st. This was the date ISTDMP table dumping first was successfully verified for all standard test cases using Watcom ATP. Although not yet using Mingw32, the Salford code has been proven compatible with Watcom.

The F77 Salford compiler has record length limited to 32 Kbytes, unfortunately. This discovery was made October 30th while studying a huge data case from Wuhan, China (see mention in the January and April issues). The previously-stated goal of minimization of the number of READ invocations is complicated by a hard limit on the associated LUNIT2 record length. For many years, the RECL= of an Apollo OPEN statement has not been used for Salford. That was a peculiarity of Apollo: need to declare the maximum record length. On comment cards, a trace of such use, which dates to the mid-80s, still can be found. So, when a READ within the new TAPSAV failed using Salford EMTP, the printed documentation of Ver. 3.51 was consulted. On page 7-17, the following was found: *"As an extension to the standard, RECL may also be specified for a file opened for sequential access. This causes fixed length records to be read from or written to file and allows a BACKSPACE to be followed by a WRITE."* I.e., this is no help. Rather than expand the maximum record length, this seems to make record length fixed (not at all what is desired). Furthermore, experimentation using the ver. 2.66 compiler at home revealed a limit of 32K for this declaration (the OPEN would fail if a larger number were used). Conclusion: the dumping of 2 or more vectors or vector ranges using a single UNFORMATTED WRITE statement has encountered in insurmountable obstacle for the F77 Salford compiler. Work has been suspended.

MUNIT6 is a 132-byte CHARACTER variable that is used for many things in many locations of ATP. Use includes output of the single line that is associated with table dumping or restoration (e.g., "*End turbo TAPSAV table restoration. KNT* = ..."). So, when table dumping and restoration are added artificially (see TSTALL < 0 use in preceding writing), there is a possibility of conflict. Most noticeable was the effect on DC-56, which involves a ROLL-ing printer plot as produced by PRNPLT. One of the output lines of the printer plot was wrong, and January 19th, after a day of searching and experimentation, this was traced to the added, artificial output of TAPSAV. The following day, local MUNSAV was added to remove this conflict and disturbance.

Interactive Plotting Programs

GTPPLOT is the interactive plotting program from Orlando Hevia of UTN in Santa Fe, Argentina. Progress has not been summarized since the January, 2001, issue, so much ground remains to be covered. The last item of progress followed the introduction *"Twenty third, dated August 27th ..."* Re-serializing to unity, the tale now continues with progress dated 7 September 2000. As usual, your Editor generally ignores the correction of errors since such information is stale and of no practical interest by the time it is seen in a newsletter. So, more GTPPLOT progress from author Hevia begins: 1) The scale of the LOGX command was enhanced; 2) The scale for the Y axis was improved; and 3) The KIZILCAY command was modified to produce better parameter fitting. Second, from the author Hevia's summary dated September 11th: 4) The user now has complete control of KIZILCAY parameters for ARMAFIT; 5) The size and location of the plot window have been placed under user control (controlling parameters are inoperative for the DOS version); and 6) Impedance can be calculated from voltage and current variables using the new IMPEDANCE command. Third, from a summary dated September 25th: 7) The FILES and DIR commands were enhanced as follows ...; and 8) The gnuplot alternative was added to the IMPEDANCE plot. Fourth, from a summary dated November 19th: 7) The COMTRADE alternative was added to input formats for conversion to a Pisa-format equivalent; and 8) An operating system command can be executed within GTPPLOT if it is preceded by an exclamation point. Fifth, from a summary dated December 3rd: 9) A new type of graphic was added to the DICE command: probability that a value will be exceeded. Output is not available in gnuplot format, however. Sixth, from a summary dated 22 December 2000: 10) The FOURIER command for negative time and negative frequency was enhanced to allow more cycles. Seventh, from a summary dated 25 January 2001: 11) The COMTRADE command was extended to ASCII Data Files (ADF of PLOTxy). Eighth, from a summary dated January 4th : 12) The LIMITS are operative for Fourier graphics of (-1, -frequency); and 13) A table of amplitude vs. time was added to GTPPLOT.LOG, for Fourier graphics for (-1, -frequency). Ninth, from a summary dated March 9th: 14) GTPPLOT now can read COMTRADE ASCII files for either 16 or 32-bit data; and 15) The BINARY COMTRADE read option was tested using externally-generated data. To be continued.

Miscellaneous Intel PC Information

That 33-MHz, 80486-based Unix and DOS computer from AT&T dealer David Szymanski was prepared for a funeral on February 27th. For background, read the story entitled *"BPA buys 486 from Szymanski"* in the July, 1991, issue. This mentions 28 May 1991 as the formal date of

order. The computer --- too big to be called a PC and too heavy to be carried by one man --- last had been used meaningfully at Skyport. This was during late January of 1998, more than 4 years ago! For many months, there had been talk of a funeral, but only after the hard disk (at least the MS-DOS partition) had been copied. The problem was this: both floppy disks had broken, and neither could easily be replaced by BPA support personnel because mechanical connections long ago had ceased to be common. Curiously, the heavily-used 5.25-inch drive had lasted the longest (the 3.5-inch drive was seldom used, yet it had broken long before BPA's move to Skyport in 1997). Perhaps the 5.25-inch drive still works today. Unfortunately, it had become incompatible with Dr. Liu's 66-MHz PC --- one of the few remaining PCs with such an older drive. Since initial occupancy at Dittmer, your Editor's idea had been to use BPA's network to offload files, but such a connection had not been used since the early '90s when it was rejected (perhaps it conflicted with Salford DBOS, which was more important). Use today clearly would have required the assistance of others, and Kris Korpenfelt of Unisys (a BPA contractor) chose to approach the challenge differently when asked for help by Dr. Tsu-huei Liu. Without apparent difficulty, he was able to connect an external 3.5-inch floppy disk and another monitor (the AT&T monitor had been used with a newer PC a year or two ago, had demonstrated problems, and had been junked without your Editor's knowledge). So, over and over, your Editor created various archives using PKZIP, and filled floppy disks, which later were emptied into identically-named sub-directories under C:\ATT486 on Dr. Liu's Pentium III.

Miscellaneous Small Items

"CIGRE source" was the *"Subject:"* of E-mail of the EEUG list server dated January 25th. This was from Orlando Hevia, who explained: *"I am working on a fitter program to obtain the parameters of a CIGRE impulse source. This is defined in CIGRE Working Group 33.01, 'Guide to procedures for estimating the lightning performance of transmission lines,' CIGRE Technical Brochure Ref. 63, Paris, 1991. The function is defined by two equations, and the parameters are ... I have a first working fitter ... I now am asking for more samples, for a copy of the brochure ... or any information that helps me to enhance the fitter. It is my idea to add the fitter to ATP ..."* This is the background that eventually led to a separate story about new sources including the CIGRE alternative of Type-15 sources.

Prof. Karen Butler's students at Texas A&M University continue to stress ATP in unusual ways. Recall Adeoti Adediran was mentioned in the July and October, 2001, issues following her overload of TACS. This time, it was the turn of Hong Xiao, whose simulation ended with a KILL = 1 error termination that complained about the overflow of List 6 (the switch table). However, while data involved plenty (894 switches), this was nowhere near the dimensioned limit (2500 will be found in the .TAM alternative of LISTSIZE as used by VARDITAM.BAT to create special TPTAM.ZIP) . Rather than general switch overflow, your Editor found the first overflow of isolated vector NBHDSW (*"neighborhood switch"*), which for 20 years has been dimensioned a fixed 5 times List 6. But this was inadequate for NAVSYS.DAT, which requires about 13K cells. If more than the default limit is required, the following new diagnostic line will be seen, provided there is no overflow: `"SUBR14 has defined NBHDSW. N6, LMNBHD = .."` where N6 is the actual burden and LMNBHD is the limit on NBHDSW storage. Of course, if the declared limit is exceeded, an error termination will result.

THERE GOES THE NEIGHBORHOOD (see the July issue) had a life span of just two days. Automatic variable dimensioning (initially, your Editor had expanded the COMMON block of NBHDSW manually) required the modification of VARDIM, and this in turn provided an alternative NBHDSW declaration as illustrated within the NEW LIST SIZES (NLS) declaration of DC-47. The F77 ATP user is advised to be careful not to request more space than exists because there is no protection against indexing beyond the end of the associated COMMON block. There **is** protection against overflow of what the user has declared, however. If space is inadequate, prior to the usual KILL = 1 error message about List 6, the user should see : `"SUBR14 overflows NBHDSW. ... Critical statistics LMNBHD, J, KSWTCH = 12500 818 894."` This was produced by Hong Xiao's data using the default multiplier of 5. I.e., size LMNBHD = 5 * 2500 = 12500, which was overflowed on switch number 818. A total of 894 switches were involved.

File editor PFE for MS Windows is superior for very large disk files as documented by Laszlo Prikler in E-mail dated February 18th. This followed the EEUG Deputy Chairman's pre-publication review of the April issue, which had discussed EDIT and mentioned the October, 2001, issue. In that earlier writing, your Editor had exaggerated. He mentioned the *"size-unlimited MS-DOS EDIT program of Win95."* Yes, very good, but not quite unlimited, as Prof. Prikler explained: *"Prof G. Varju received a huge file (~16 MB) that included some traction field test records in tab-separated column format. Massimo Ceraolo's PlotXY was a good candidate to display the measurements (PlotXY accepts .adf -- ascii data file -- as input). The problem was the missing header at each column and the missing blank line at the beginning to make the data file .adf compatible. So the task was to insert two text lines at the beginning of the file. Win 98's EDIT or Notepad failed to read such a large file. Excel gave up soon, after reading several thousand lines. Word was working heavily and began to read the file, but I had to give up after some minutes of inactivity (program not responding). Then I installed*

PFE from the 2001 CD of EEUG, and was able to read that 16 MB file, make the necessary modification, and display the results using PlotXY."

DRWBAR ("draw bar") was an installation-dependent graphic module to draw and fill a vertical rectangle as part of a Fourier or harmonic (if FS or HFS) display. DRWBAR ceased to exist February 21st after the DISLIN alternatives of GNU and F95 Lahey were removed, and new translations were tested. Inspiration for the elimination of DRWBAR came from BPA's Dr. Tsu-huei Liu while another, bigger problem (the installation-dependence of SPY VECPLT) was being discussed. The job was not easy (perhaps 2 days of work by your Editor were required), but results have been satisfying. Years of divergence have been eliminated. Code now is clearer, more compact, and it should execute faster due to elimination of the CALL statements, which involved 6 arguments. The only enduring installation dependence is a single line that controls the height of numbers under the bars. This has been modularized in new VECBA1 to allow continuing different treatment for VGA resolution and bigger fonts used with Salford EMTP. Thanks to VECBA1, aesthetics should be unaltered by the reform.

"Quidquid latine dictum sit altum videtur. Whatever is said in Latin sounds profound." This was the humorous ending to E-mail from Kris Korpenfelt during February.

Parameters IHSPL4 and MODHFS were missing from UNFORMATTED .PL4 files prior to an enhancement to CIMAGE on April 6th. BPA's Dan Goldsworthy had requested the improvement for VAX ATP after observing that FORMATTED .PL4 files had the information whereas UNFORMATTED did not. In E-mail the previous day, your Editor had observed: *"I believe this to be correct. I also believe that the difference has nothing special to do with VAX. The UNFORMATTED .PL4 alternative is inferior in several ways, and I believe you have found yet another. The same lack of IHSPL4 has been demonstrated using GNU Mingw32 ATP ... I suppose the missing output could be added without too much trouble. UNFORMATTED is universal, anyway, so the work need only be done once. Whether some other program (e.g., a plotting program) might be upset as a result is not known. I guess this would be learned by trial and error."*

Creation of a COMTRADE file is possible via a third alternative (in addition to TPPLOT and GTPPLOT of years past). Deputy EEUG Chairman Laszlo Prikler announced availability in E-mail of the EEUG list server dated April 11th. Massimo Ceraolo of the University of Pisa in Italy is the author, and this new tool from him is available as follows: *"You can find the new converter in the EEUG secure web site ... The program is able to manage all the possible conversions (except that writing into .PL4 files is presently not implemented) between the following formats: 1) ATP (.PL4); 2) ASCII PlotXY (.ADF); 3) Matlab format v 4.0 (.MAT); and 4) ASCII COMTRADE C37.111-1999 format (.CFG and .DAT). A four-page manual (PDF) is also included ... which describes the program capabilities and use."*

"EMTP requires some extra space. Logic does not check for overflow of everything that is defined before it is defined. If it did, the program would be much bigger, and would execute slower --- just as any program that checks for out-of-bounds subscripting of arrays is slower. There is no free lunch on this issue. If a user ever is in doubt about the effect of minimal free space, it is easy to remove LISTSIZE.DAT and verify that the solution is unchanged. This is easy as long as table dumping is not involved." This was the advice from your Editor to Dr. Michael Steurer of CAPS at Florida State University in Tallahassee. This was in E-mail dated March 3rd.

A more nearly true display of input data card images is the result of a change to TFLUSH that ended April 9th. In fact, the TFLUSH change was trivial: use of CARDIN rather than ABUFF. More complicated were required corrections to other parts of the program, to make all DC*.LIS output believable. Perhaps half of these solutions have changed in superficial ways (numbers are not affected, in general). As an illustration, consider the beginning of standard test cases. Whereas the outputs of DC-1 and 2 were unchanged, DC-3 through 9 produced slightly different output. One type of difference is the display of lowercase data. For years, this had been lacking under certain circumstances. An illustration is provided by the 2nd branch card of the first subcase of DC4.LIS :

```
 Old:  |  TRAN        NAME  R-MAG   1.E4  ...
 New:  |  TRAN        NAME  R-mag   1.E4  ...
```

Of course, the data file involved lowercase "mag" so the old output really was not quite right. The new output is.

DC-51 and DC-52 demonstrated many differences following the overhaul of text that ended April 9th. Perhaps most unexpected was a small change immediately following the output of each experimental solution. The following two lines document the first of these :

```
   2)  Freq [Hz] = 6.00000000E+02   Total  …
Compute overhead line constants.  Limit = 98  |
```

That vertical bar actually is in column 51, and it is the marker for column zero of the card image ruler of data card interpretation. But in this case, what data? There is none. The execution of LINE MODEL FREQUENCY SCAN (LMFS) is not driven into LINE CONSTANTS by data. Rather, the connection is made automatically in code. For a decade or more, the extraneous card image appeared to be truly blank, so it went largely unnoticed (no one complained about it, anyway). But with the reform of TFLUSH to display raw input data cards rather than the result following removal of comments and possible adjustment of case (if KINSEN = 1), suddenly the content to the right of column 51 became highly noticeable and incorrect. It was the previously-read and interpreted card: *"BLANK card ending node voltage*

outputs" Of course, output at and to the right of column 51 was removed. But what about the text on the left? While such output serves little useful purpose, your Editor decided to retain it for historical reasons (continuity with the past). It does remind the unfamiliar user of the internal transition from F-scan to LINE CONSTANTS.

Dependent List Size 53 was corrected on July 6th, and this resulted in a modified header line. Following the change to VARDI2, any standard test case produced: "Total size of LABCOM tables = 230090 …" where the ending number is 8 words smaller than it had been. No observable list size has changed, but vector CURSUB of compensation has changed in size. This vector now depends on List 9 (the number of single-phase nonlinear elements) and List 25 (working space for the U.M.) since these are the two elements that employ compensation. Previously, the dependence involved List 17 --- the number of Type-58 or 59 S.M. components. This was wrong, yet no one ever complained. Why? Presumably because CURSUB never overflowed (use **was** protected). A little space was being wasted, and no user had any easy way of knowing. But your Editor had realized the mismatch some years ago. His TO.LIS disk file (renamed from TODO.LIS following trouble reading on his usual floppy disk) carried this note: *"Investigate List 53 dependence on List 17. Late in 1998, this was removed and changed to List 25. But then the old code returned. Why?"* For no good reason, as far as your Editor can determine at this late date. Why was nothing done earlier? Procrastination probably provides a partial explanation. Also, it seemed wasteful to change every standard test case without substantial need.

A $UNITS declaration should precede the punching of branch cards for a Pi-circuit as created by any supporting program. This was the great idea from Orlando Hevia of UTN in Santa Fe, Argentina, contained in E-mail dated July 12th. Mr. Hevia mentioned his recent ATP short course: *"I received a question from a student of our course."* Also, he mentioned concern of Laszlo Prikler, who *"wrote a paper in EEUG News, August 2001, Number 3, Volume 7, with similar possible cause of conflict, when the user uses ATPDraw to generate CC data for nominal Pi-lines. His solution is two lines with header of dbm .lib file ... It may be convenient to add these lines in CC, as was done for BCTRAN?"* Yes, the idea is great in theory: specify the units of the branch cards as they are created. I.e., declare the units of branch cards explicitly rather than leave them implied (and/or specified at the point of usage). Implementation proved to be slightly complicated, however. The first supporting program to be modified was XFORMER in OVER24 as illustrated by DC-15. Note the 8 new comment cards that begin on line 10 of the .DAT file --- cards that precede the definition of STATFR (the power frequency). The text carries date July 18, and it explains that STATFR is not part of XFORMER data. Reactances are involved, but what is the frequency? All ATP can do is assume the power frequency, and advise the user to correct this (see the in-line comment on the $UNITS card) if the value being punched is not right. Note the deliberate use of 400 Hz to illustrate how arbitrary the frequency is. Answers are unaffected by the frequency. What else has changed? For the cross-bonded cable of CABLE PARAMETERS (CP), DATOUT was modified. For LINE CONSTANTS (LC), SUBR25 required change, and this was the most complicated of all because of flexibility that came from Mr. Michelis of KEMA in Arnhem, The Netherlands. The user has independent control over both R and X units, so there are 4 different possibilities. Only one --- XOPT = 60 and COPT = 0 --- is illustrated in DC-59, however. See the 7th subcase, with exceptional IPUN = 44 keyed in columns 67 and 68 of the frequency card.

Branch voltage output that is declared by a 2-punch in column 80 of a branch or switch card was incompatible with FIX SOURCE (the load flow of ATP) prior to a correction to FXSOUR on 22 July 2002 (see code surrounding new variable LIMIBS). The 4th subcase of DC-25 has comment cards that explain this. Also, a "2" has been added to column 80 of the first branch card to demonstrate correct operation (prior to the correction, this request was ignored). Unused space within List 12 storage is required for the reform, it should be mentioned. If this is inadequate, ATP should issue a warning message: *"+++ Warning. List 12 space is too small to restore branch voltage outputs following FXSOUR load flow."* Should this happen, nothing has been either gained or lost (in effect, the branch voltage output will be ignored). About history, the error is old, dating to Apollo workstations (last used at BPA in 1990) with their superior windows and graphics. The conflict occurred because Apollo ATP could use SPY plotting to monitor convergence of the load flow iteration. But not only is Apollo gone, PCs today are so much faster there no longer is much interest in interactive monitoring of the load flow convergence. Concerning credits, the first user to notice and complain about the lack of branch voltage outputs was Orlando Hevia of UTN in Santa Fe, Argentina. His E-mail dated July 19th reported: *"I send you a data case from a user. The case is from a course of Eichi Haginomori. The case has six switches. The switch voltages are not written by ATP with IOUT = 2 ... The NAME-ed switch option does work, however."* Note mention of the column-80 punch. Mr. Hevia correctly observes that the conflict could be avoided by delayed and alternative declaration of branch voltage outputs along with node voltage outputs. There was a small, unrelated effect of the reform, and this might be mentioned. List 7 stores A6 names other than those for electric network busses, and demands of this storage have decreased slightly due to better programming. FXSOUR is called twice during a load flow solution, and names were unnecessarily being stored for the second of the two executions. By eliminating the second storage, space was saved. For example, the 1st subcase of DC-25 reported a decrease from 41 to 38 cells for the burden on List 7.