Can / Am EMTP News

Voice of the Canadian/American EMTP User Group

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Table of Contents

Salford Compiler & DOS Extender

DC-1 was the test case used by Robert Meredith of New York Power Authority (NYPA) for his 66-MHz timing that was mentioned in the previous issue. This important detail was missing in the writing of column 2 of the front page, unfortunately. About Mr. Meredith's pioneering use of SMARTDrive, BPA's Fred Elliott reports similar satisfaction. For his 25-MHz, 386-SX home computer running DOS 5, Mr. Elliott reports that the total time for DC-1 was reduced from 436 to 415 seconds when he switched from the Salford disk cache to SMARTDrive, which he uses along with Quarterdeck's QEMM (the memory manager of DESQview). The same 2 Mbytes of 8 Mbytes total RAM were dedicated to SMARTDrive, it should be added. Unlike Mr. Meredith, Mr. Elliott noticed no difference for time spent in the time-step loop, however.

Possible SMARTDrive incompatibility with DBOS/486 Rev. 2.66 as used by most readers was suggested on May 11th in FAX from Mr. Meredith's colleague, Robert A. Schultz. It seems the original NYPA testing used DBOS/486 Rev. 2.67, and there was some trouble when an attempt was made to switch to Rev. 2.66. Yet, BPA's Fred Elliott noted no such problem (maybe QEMM protected him?). Anyway, BPA was happy to rush NYPA a copy of the user group's DBOS Rev. 2.67 by Federal Express later that day. Because files total about 1.3 Mbyte, a 5.25-inch floppy disk can not be used directly. On the other hand, Dr. Liu noted that not all files are compressed. By applying PKZIP, she produced a single archive of less than 900 Kbytes! Except that it will be a little more complicated to handle, this would seem to be the way the user group will distribute DBOS with version numbers higher than 2.66 when the decision to change is made.

DBOS/486 Rev. 2.70 was sent to Prof. Bruce Mork of Michigan Tech by Tony Webster in Salford, England, following an inquiry about some sophisticated networking problem in Houghton. In E-mail dated April 29th, Prof. Mork explained: *"I was going to try it out right away, but [Prof.] Leonard Bohmann is teaching a class that is using*

ATP this quarter. He decided not to mess with the system until after his students are done with their final projects. Maybe I will be able to check this out in about 3 weeks or so." Also, May 15th, Dr. Kizilcay indicated by telephone that he had the Rev. 2.70 compiler (FTN77/486) .

The new MS-DOS version 6 is of interest to many readers. It is the dominant cover story of *PC magazine* dated April 13th, which begins as follows on page 108: *"DOS 6 : The Ultimate Software Bundle? Disk compression, memory management, file backup, virus protection --- DOS has evolved ... Nothing in DOS 6 is particularly revolutionary. Nonetheless, DOS 6 is vitally important for two reasons."* What about DOS 6 in relation to Salford DBOS Rev. 2.66 that we now all use? BPA's Fred Elliott, using his 25-MHz 386-SX home computer, was the first to describe his experimentation. It was on April 12th that he reported compatibility. At first he thought simulation using DOS 6 might have been slower, but subsequent controlled experimentation using DC-1 indicated no significant difference. Using DISK to create DC1.LIS, the time-step loop now requires 378.188 sec (compare with 378.734 sec for DOS 5).

Wall-clock time of the time-step loop will be sent to diagnostic output file DEBUG.LIS for all computers. This began April 1st when the associated code was added to universal timing SUBROUTINE TGRUNT following a reminder of the need by Robert A. Schultz of New York Power Authority. This is a Salford EMTP story only because the feature should serve to level the playing field in Salford's favor. Remember, Salford EMTP case-summary times come from MS-DOS, which maintains only real (wall-clock) time. MS-DOS is a single-user operating system with no time-sharing. Yet, Salford EMTP wall-clock times regularly are compared with the shorter **process** times of time-shared computers. Yet, for workstations, the benchmarker **can** ensure that no other process is running, so there is no excuse for reliance upon process time rather than wall-clock time. To illustrate the new feature, consider output from your Editor's 33-MHz 486 for DC-1. Corresponding to 65.495 seconds in the case-summary statistics is the following line of output:
TGRUNT. Wall-clock times for the time-step loop are:
04.12.09 04.13.15
The first use on a DEC VAX / VMS workstation was the VAXstation 3100 M76 SPX of BPA's Eugene Davis. Again using DC-1, the case-summary statistics showed 113.010 seconds whereas the actual time was 128 seconds (52:02 - 49:54), which is 13% bigger.

Saving of the screen prior to the switch to graphic mode for CALCOMP PLOT usage of Salford EMTP was the first of many improvements that have been copied from the work of Robert A. Schultz of New York Power Authority (NYPA). A separate, later story provides an overview of the important NYPA contributions. Prior to March 20th, any CALCOMP PLOT of a test case would be followed by a blank screen (the return to text mode). Now, the original screen text, which was saved from BIOS address 'B8000' using the Salford utility COPY_FROM_REAL_MODE1, is loaded back onto the just-blanked screen using the companion utility COPY_TO_REAL_MODE1 . The effect is noticeable for simulations that satisfy two conditions: 1) output goes only to disk (using DISK not BOTH); and 2) a CALCOMP PLOT is followed by more simulation. A good illustration is provided by standard test case DC-53. Previously, the screen would be blank during the entire second subcase, and this was annoying. Now, when screen graphics end after -D4FACT seconds, the original text documenting the execution of DC-53 is seen once again, providing context for the continuing execution. This is a small change, but a nice one.

New variable KOLBAK of disk file GRAPHICS defines the background color of Salford screen plotting as first used on April 5th. A non-positive number will mean none --- a continuation of the formerly-fixed black background. On the other hand, value 16 is a missing color (also black). Name KOLBAK was copied from TPPLOT, which was given identical control last August.

Correct 768 x 1024-pixel Salford screen graphics were added to Salford EMTP during the weekend of April 3rd and 4th following success with TPPLOT (see following story). Variables NXMAX and NYMAX already were available, so only new variables KOLORS and KVIRTU (same names as TPPLOT) had to be added. Fred Elliott confirmed correct operation at BPA the following Monday (April 5th) after adjustment of the pixels per inch to NXINCH = 90 (from Prof. Laszlo Prikler's use of TPPLOT) and NYINCH = 86 .

Color bit maps in the form of .PCX disk files are another improvement to Salford EMTP that has been copied from the work of Robert A. Schultz of New York Power Authority (NYPA). New variable NODPCX of disk file STARTUP will either select such output (if not unity) or will prevent it (if unity). The disk files themselves have fixed names: ATPVIDEO.001 for the first, etc. (see later note about the serialization). Any existing files of the same name will be overwritten (no problem). For batch-mode solutions, the reader should note that the MS-DOS RENAME command with a wild card will preserve any .PCX files. For example, DC-35 will produce two, and these can be converted to permanent storage after execution is complete by: RENAME ATPVIDEO.* DC35PCX.* For the record, .PCX output became available April 5th.

Screen plotting now is omitted automatically if DISK (not BOTH) is used to send printed output to disk as a .LIS file. This is new. Previously, the character output would **not** be seen on the screen, but graphics produced by CALCOMP PLOT or vector SPY PLOT **would** be.

Now, the vector graphics accompany the text: they are sent only to disk as .PCX files. Since the monitor and output card are not being used at all for such an operation, it follows that the output resolution is arbitrary. That's right, even a computer having no graphics better than standard 350 by 640-pixel EGA can create 768 by 1024-pixel .PCX files! Then these could be viewed through an EGA window using TPPLOT (see use of backward apostrophe ` in the next story).

H-P Laserjet series II has been added as a possible output device for batch-mode plotting. As with earlier implementation in TPPLOT (the LJ2 subcommand of the PAPER command), the Laserjet output has been added in parallel with earlier Epson output. That is, EMTP data is unaffected (the same PEN PLOT declaration is used). The choice between Epson and Laserjet is made in the GRAPHICS file where the variable LASERJ is set to unity for Laserjet output or zero for Epson dot-matrix output. Following the lead of Robert A. Schultz of New York Power Authority (NYPA), all PEN PLOT output files are named ATPPAPER.001, etc. Recall that Mr. Schultz named his .PCX files ATPVIDEO.001 , etc.

HP-GL (Hewlett-Packard Graphics Language) was added as an extra, auxiliary output for batch-mode plotting during the weekend of April 17th and 18th. Unlike Dr. Tsu-huei Liu's earlier implementation in TPPLOT several years ago (today requested by the HPGL subcommand of the PAPER command), HP-GL output of EMTP is created at the same time as screen or PEN PLOT graphics if not disabled (new binary switch NOHPGL of STARTUP will suppress such output if given a value of unity rather than zero). Even though Robert A. Schultz of New York Power Authority (NYPA) never used HP-GL , this HP-GL output is considered to be a part of his revolution. Mr. Schultz used PostScript because NYPA printers were equipped to handle it. But the average ATP user does not have such capability, so your Editor decided to change the dialect to something cheaper and more commonly available for the initial installation. Yet, Mr. Schultz's PostScript has not been replaced by HP-GL according to current thinking. Rather, PostScript is yet to come --- in parallel with the just-added HP-GL.

KNTPLT is a new variable to serialize plots of all types. Each batch-mode plot card that is interpreted ("Plot card. ...") will cause this counter, which begins at zero for each program execution (not for each data case or even for each disk file), to be incremented by one. This is yet another of the reforms from Robert A. Schultz of New York Power Authority (NYPA). The idea is a good one. Each recognized plot request is given a number that will be used to identify any associated graphic disk files that are produced. For example, the third plot card of DC-35 produces graphic files ATPVIDEO.003 and ATPHPGL.003 because this is a vector screen plot. No .002 file exists because the preceding plot was a PRINTER PLOT. The 4th plot follows a PEN PLOT declaration, so instead of ATPVIDEO.004 there is a file named ATPPAPER.004 for a Laserjet printer (assuming LASERJ of GRAPHICS has value unity).

The KTRPL4 parameter of STARTUP is supposed to tell Salford EMTP which disk drive is being used. Protection against a bad value has existed for a year or two, leading to a program halt prior to the opening prompt. Unfortunately, increasing numbers of recipients of the Salford GIVE1 disk are tripping over this because MS-DOS 5 requires no partitioning of the hard disk (the former 32-Mbyte limit is gone). As a result, the average recipient should change from value KTRPL4 = -4 as distributed by the user group to value -3 (meaning C:). But some forget. So, on February 5th, more logic was added. Rather than halt, Salford EMTP now tries to change the absolute value of KTRPL4 to three.

The STARTUP file no longer is created by users as a way of indicating their graphical standard. No longer is there a different version (.EGA, .VGA, .600, etc.) for each different graphical standard. Information depending on screen resolution has been moved from STARTUP to GRAPHICS where other graphical information has been all along. There has been a general reduction of information as well as unification. Former redundancy (e.g., the appearance of NXMAX in both files) obviously has been eliminated. For each of the 15 parameters that have been removed from STARTUP, the former name has been replaced by **Unused** on the comment line. The location of no other parameter has changed as part of this reform that began April 11th. For the record, in order of original appearance, the 15 former parameters follow: LCHSUP, LCHTIT, LCHXAX, LCHYAX, NXINCH NYINCH, NXOFF, NYOFF, LCHFIL, NXID6, NYID6, NXMAX, NYMAX, LTIC, and NXVERN .

The GRAPHICS file has been expanded by two changes: 1) the removal of some 15 resolution-dependent graphic variables from STARTUP; and 2) the addition of parameters to control both the new .PCX files and also the new output for H-P Laserjet series II printers. Yet, just as with STARTUP , total size of the associated information has been reduced considerably. No longer are there different versions for different screen resolutions. Definitions of parameters appear after the data itself (previously, these were in READ_ME.DOC). By far the most important parameter of GRAPHICS now is the first: NYMAX , the total vertical pixels of the screen, to which the user can respond in three ways. First, he could choose among the five, standard supported values: 350 for EGA, 480 for VGA, 600 for 600 by 800, 768 for 768 by 1024, and finally, 1024 for 1024 by 1280. The second of three alternatives is to leave NYMAX blank (or zero), in which case ATP will assign the highest resolution that DBOS believes can be supported by the hardware being used.

Note that this may be different from what the user might or might not have told CONFIGDB about available graphics. The third and final alternative is a special value NYMAX = -7777 which represents a request to read some 12 parameters including NYMAX from an auxiliary file GRAPHICS.AUX .

GRAPHICS.AUX should never be needed by the average user. It is a secondary set of graphic parameters that generally can be deduced from the primary set (the independent variables) in GRAPHICS . One example is total horizontal pixels NXMAX , which normally can be assigned once the total vertical pixels NYMAX are known. A second example is horizontal and vertical pixels per inch, NXINCH and NYINCH. Rather than reflect the real screen resolution, in fact these always were chosen so the 10-inch horizontal and the 8-inch vertical axes filled most of the screen --- regardless of the physical size of the monitor. Etc. (in all, some 12 parameters now are viewed as dependent, so have been removed from the GRAPHICS file). The average user need never consider GRAPHICS.AUX . But it is available for the one in ten or one in 20 who has non-standard hardware, or who wants to finely tune the appearance of his plot. For the record, in order of appearance, the parameters of the .AUX file are: NXMAX, NYMAX, NXINCH, NYINCH, NXOFF, NYOFF, NXID6, NYID6, NXVERN, NYVERN, IDXBAS, and finally, IDYBAS . They, too, are explained in English-language definitions that follow the 4 data lines (all that Salford EMTP actually reads).

QUARTER PLOT is the new declaration for batch-mode plotting that will result in four half-width and half-height plots being assembled on one screen or page. This is for CALCOMP PLOT usage. With increased screen resolution (768 by 1024-pixel graphics now are standard), quarter-sized plots do not look bad on modern color monitors; and by using PEN PLOT, higher-resolution (up to 300 dots/inch) hardcopy is possible for laser printers. The QUARTER PLOT declaration is to be followed by plot cards that define one plot for each quarter of the screen that is to be filled. The default number of quarters is four, so typically 4 plot cards will follow. For fewer than 4, the user must explicitly define this smaller number of active quarters in column 32 of the QUARTER PLOT declaration. Interpretation of the QUARTER PLOT declaration will include the number of active quarters along with extraneous mention of computer expert David Szymanski: **"Dave Szymanski plotting. NUMPIP = 4."** Since Szymanski's pipe plotting is not used by Salford EMTP, code was saved by forcing the new QUARTER PLOT to share Szymanski's code. For the case of screen graphics, character output of the program might require suppression immediately after interpretation of the first of the plot cards that define the four quarters. This is because the first quarter is plotted before the input data card for the second or later quarter is read. If real screen plotting is used, the screen must be held in graphic mode until the plot is complete. During this time, character output to the screen can not be permitted, obviously. But there is no such conflict if the virtual (RAM) plotting of Robert A. Schultz is used (in this case, the real screen is used for display only after all 4 quarters have been plotted). Should the program need to suppress output, there will be a warning at the point of suppression: **"---- Begin suppression of text output. Remember plot cards for 2nd and later quarters will not be seen."** For an illustration of QUARTER PLOT use, see BENCHMARK DC-35 dated April 17th or later.

Jeff Bohn of Southern California Edison (SCE) in Rosemead (a suburb of Los Angeles) should be credited with the motivation for QUARTER PLOT to make plots of reduced size. During a telephone conversation on about April 13th, your Editor told Mr. Bohn that such reduced-size plots were not possible. But after ending the conversation, some thought convinced your Editor that the idea was good. It only remained to think of a feasible way to minimize the programming (another couple of days of casual thinking led to the idea of 50% scaling as being the easiest). As an expression of gratitude for the inspiration, new GIVE1 (both TP3 and TP20) and GIVE2 disks were mailed to Mr. Bohn from the BPA Mail Room on April 21st.

Weitek acceleration of simulation could not be demonstrated by Taiwan Power Company in Taipei. The first simulation times for Weitek 4167 connected to a 66-MHz 486 arrived at BPA in FAX dated March 2nd. These numbers from Shui-Hsiu Lin implied that use of Weitek actually slowed simulation. This was confirmed in words in subsequent FAX dated 19 March 1993 : *"Compiling with /Weitek option does slow the computation."* So, readers are advised to be skeptical of claims about Weitek or any other coprocessor that is supposed to assist the 486 microprocessor. At least for high Intel speed (66-MHz in Taipei), the gain might be illusory or negative. Your Editor recalls that computer expert David Szymanski did not find Weitek 3167 to be attractive for 20-MHz 386s, either. Mention appeared in the April, 1991, newsletter. The subject has not been news since then because results did not meet expectations. Now, a generation later (486s rather than 386s), the conclusion about Weitek would seem to remain unchanged.

Improvements to Salford TPPLOT

IEEE COMTRADE is a new **input** .PL4 file type for TPPLOT as explained in a separate story.

Correct 768 x 1024-pixel Salford screen graphics first were demonstrated at BPA on April 2nd using the old 33-MHz, 386-based Micro Express of Fred Elliott. No, nothing has changed. Why the experiment never was performed last July is difficult to understand now that we

know the answer (it works!). There are many 386-based Micro Express computers nearby. This was the standard BPA engineering computer for a while. It may still be. But apparently the output cards were not standardized. According to some diagnostic program, Mr. Elliott has a Tseng 4000 SVGA card, and Salford TPPLOT with SET DATA 4 works perfectly. I.e., there is not a hint of wraparound. The graphic cursor is not visible, though (a problem observed before by other users of other computers even at the lower resolution of 600x800 pixels).

The graphic cursor, which consists of cross hairs, now appears quicker after the display of a new graphic screen. This small improvement was made April 24th following an investigation to pinpoint the previously annoying delay. Responsible for most of the delay was definition of the cross and the digital readout box, which was being repeated each time the cursor was made visible. Now, the first appearance of the cursor remains slow for your Editor's 486, but the second and later appearance is much quicker due to omission of the repeated definitions. It is surprising that these seemingly trivial definitions could require noticeable time, but they did!

The backward apostrophe ` is used as a binary toggle between the default meaning of the arrow keys (to position the graphic cursor when in graphic mode) and their use to position the window onto a higher-resolution bitmap. Remember, if a .PCX file has higher resolution than the display, only a portion will be visible on the screen following loading by COPY of BITMAP. Prior to April 8th, it was always the upper-left corner that was seen. Now, this is just the initial view. Pressing the right arrow --> or the down arrow will displace the window in the associated direction by fraction PCTMOV (default value 0.2, this can be changed using index 88) .

LIMITY of integer index 262 is a new parameter to define maximum Y-pixels for the output card and monitor being used. If SET DATA ?? continues to be used, intelligence of the Salford library will be used to define this automatically. Any other SET DATA without "??"
will avoid the automatic definition, and will allow the user to make a manual definition. This new parameter LIMITY has significance because it limits the new dynamic increase in graphic resolution using the plus ("+") key. Similarly, the minus ("-") key will reduce the resolution by one step, with the minimum being 350 by 640-pixel EGA. Other recognized steps are standard VGA (480 by 640), the original super VGA (600 by 800), 768 by 1024, and finally, 1024 by 1280.

The Trident TVGA 8900C graphic card used by Mr. Elliott at home proved to be compatible with 768 by 1024-pixel graphics the following day.

HP-GL output for window plotting (the WINDOW command) first became available on April 22nd. Unlike the usage for non-window plots, no separate HPGL subcommand of the PAPER command is issued after a pleasing screen plot. Instead, for window plotting, the desire for HP-GL output must be declared **prior** to the screen plot. It is binary parameter NOHPGL of integer index 263 (for TPPARAM.DAT use) that either orders HP-GL output (if zero) or prevents it (if unity) during the window plotting on the screen. Pen number J is used for curve number J no matter which window it might appear in. Otherwise, the choice of pens is unchanged from what already has been defined for Dr. Liu's original (non-windowed) HP-GL output.

Button 2 clicked on a name of the PL4 display, following the PL4 command, will result in Vernon Buerg's shareware utility LIST being used to display that file. This new operation became effective March 14th. Of course, UNFORMATTED or C-like files are not very readable as ordinary text. But remember that **Alt-H** switches LIST to the hexadecimal mode of display.

The HPGL command of Salford TPPLOT will produce a disk file of HP-GL output that approximates what is seen on the screen. However, previously TPPLOT would not directly plot the HP-GL disk file. Now, by reliance upon an excellent shareware utility named PrintGL, it will. For details about PrintGL from Ravitz Software, see a separate story. An initial, quick implementation was coded the weekend before the Florida short course, and was rushed to Gainesville at the last minute (it arrived Tuesday by Federal Express). The following weekend (March 13th and 14th), additional thought and work allowed improvements.

An HP-GL file that has been produced by either Salford EMTP or TPPLOT also can be viewed using code that was written by your Editor. As good as Ravitz PrintGL is, it nonetheless has some disadvantages. One is the $40 licensing fee that a satisfied user is supposed to pay. Another is lack of dynamic zoom (the scaling factor is specified as the program is entered), and the fixed aspect ratio (it is not possible to scale one dimension differently than another). So, your Editor decided to write his own software to display HP-GL. It is index 87 that controls alphanumeric parameter HPTARG --- the target for Ravitz graphics. If this is blank (the default choice beginning May 6th), TPPLOT will use your Editor's interpreter rather than the Ravitz one. For more details, see the story following the one about Ravitz PrintGL.

The former HPGL*.LIS files, which were created by the HP-GL subcommand of the PAPER command, have been renamed. For uniformity, disk file names TPPHPGL.001, etc. are used for both these HP-GL files and also for the ones created by window plotting. This is similar to the naming scheme of Robert A. Schultz of New York Power Authority (NYPA) for .PCX files.
Entire families of HP-GL files can be inspected either as

text or as graphics. This is under the HP-GL subcommand of the FILE command, which now has the prompt: " SEND HP-GL FILE NAME [ATPHPGL.*; TPPHPGL.*; END] : " Note that the first two mouse targets within square brackets are names of families of HP-GL files --- first for batch-mode EMTP plotting, and second for output of TPPLOT. Clicking button 2 of the mouse on either of these two targets will LIST the family using Vernon Buerg's shareware utility. Remember that **Ctrl-Page Dn** switches to the next file of the family, arrow and page keys scroll the current file, and **F10** will end the use. That was button 2, for text-mode inspection. Use button 1 for graphics. The result will be output of the MS-DOS DIR command in the dialogue window. The user then clicks button 1 on his desired entry point --- the first member of the family that is to be graphed. For details of manipulation while viewing an HP-GL file, see the separate story.

New integer parameter KVIRTU allows the user to choose virtual screen plotting rather than the original real screen plotting. At issue is only the initial destination of each graph as it is being drawn. Originally, this was the real screen, which remains the default choice (and which corresponds to a KVIRTU value of zero). But if the binary switch is toggled to unity (using integer index 260 within TPPARAM.DAT) , the plotting instead is done in RAM . In this case, only after plotting has been completed in RAM is the bitmap copied to the screen for the user to see. Understand that this implies a new pause (nothing is seen during the original plotting), followed by a quick display (already seen for **Page Up** or **Page Dn** to display previous bitmaps). Because of the pause, the new virtual mode of plotting seems to be less desirable except for the case of 768 by 1024-pixel monitors. This is the great discovery of Robert A. Schultz of New York Power Authority (NYPA) as further explained in a later story. Somehow, virtual plotting avoids the wraparound that has plagued real screen plotting as described in the last paragraph on page 2 of the July, 1992, issue. The initial extension controlled by KVIRTU was made on March 25th, although nothing was given to others until March 29th when a disk was mailed to Prof. Laszlo Prikler in Budapest, Hungary, for verification. Two days later, all associated files (including source code) were sent to NYPA by Federal Express. Confirmation of correct operation was received on April 9th by E-mail from Budapest.

Resolution of Salford graphics now is selectable at execution time rather than prior to execution. Previously, the user had to select his graphics using Salford utility CONFIGDB . Now, the selection is done dynamically --- during the switch from text to graphic mode. In fact, the resolution can be modified during execution. The user could begin with EGA graphics for the first plot, then switch to VGA for the second, etc. Most commonly, SET DATA would be used for this, to redefine the three controlling parameters (see next paragraph). As explained in a separate, later story, this is another change inspired by Robert Schultz of New York Power Authority (NYPA).

New integer parameter KOLORS allows the user to specify the number of colors for his plotting. Thus far, only the default value of 16 has been used, regardless of screen resolution. But selection of the desired graphical mode requires three integer parameters: NXMAX (the number of horizontal pixels), NYMAX (the number of vertical pixels), and this new KOLORS value. Any user who wants to experiment with different numbers of colors now has direct control (integer index 261 within TPPARAM.DAT is being used) . More colors are expected to come with time, just as higher resolution (768 by 1024) already has.

AUTO CACHE is a new, hidden command that allows screen plots to be replaced by automatic caching (the SAVE, SHOW, and END subcommands of an implied CACHE command) for later plotting. Send the plot command @CAUTO to illustrate usage that first became available March 17th. Inspiration for the feature came from a student at the Florida short course. This was Zhao Ma of GEC Alsthom in Stafford, England. Mr. Ma had complained to Dr. Liu that the use of CACHE was laboriously low-level. Also, he did not want or need to see the component plots. Why not provide a higher-level command that would skip component plots and produce only the final superposition? After a little thought, your Editor agreed, and designed the AUTO CACHE switch, which was added to the bottom of the purple, pull-down CONTROL submenu).

PostScript graphics seem more resistant to display by shareware, unfortunately. Fargo list server mail dated March 9th had mentioned the Ravitz solution for HP-GL, and had asked subscribers whether they knew of any shareware to display PostScript in similar fashion. It was MODELS author Laurent Dubé who first responded negatively. By E-mail the following day, he indicated that he could locate none. Neither has anybody else since then. On the other, your Editor obviously could convert his own free HP-GL interpreter (later story) for such use!

New integer parameter LISTYP controls possible use of Vernon Buerg's superb shareware utility LIST. Both the TYPE command (to look at any file) and the LIST subcommand within the SET DATA command (to look at TPPARAM.DAT) now allow use of this alternative tool for display. Integer index 258 of SET DATA is a binary flag that should be toggled to unity (from the default zero) if LIST is wanted. The ability to look at arbitrarily large files, to scroll sideways (for 131-column .LIS files, for example), and to search for a character string, are all possible after February 26th.

News from Outside USA and Canada

A printed copy of the January newsletter was mailed by BPA to each of its primary EMTP contacts on March 2nd as had been predicted in E-mail from the Fargo list server the preceding day. A copy of the 6-page form letter that is used for Can/Am licensing, revised on 26 December 1992, was included. All photocopy was single-sided, although double-sided, secondary printing was encouraged in the E-mail.

Those LEC ATP Rule Book files have proven difficult to convert to WordPerfect at BPA. This is a continuation of the paragraph in the middle of column 1 on page 4 of the preceding issue. On April 2nd, there was an attempt at BPA to move H04.DOC from Lotus Manuscript to WordPerfect. The old Manuscript Version 1.0 still exists on the nearby 286-based ATP, so this was used. Try to **Edit** ===> formatted for different printer. Then space bar ===> convert to LJ2 (selected from menu). Then extra, non-keyboard characters preceding each <CR>, and sometimes inside a word (e.g., between the C and H of BRANCH on the very first line). Convert to DCA. Once in WordPerfect, these appear as question marks. They appear the same way in Word for Windows. Also, the fifth of the eleven uses of Tab on the first page is not properly aligned (e.g., after stars in the middle of the first page).

LEC is offering an interesting 3.5-day EMTP short course July 5th through the 8th, 1993. The titles of lectures are: 1) *"Reduced-order network equivalents"* (by Dr. Mustafa Kizilcay); 2) *"Modeling control systems"* (by Prof. Gérard-André Capolino and Mr. Laurent Dubé); 3) *"Rotating machines"* (by Prof. Juan Martinez); and finally, 4) *"Electrical drives"* (by Prof. Capolino). *"A basic knowledge of ATP input rules is a prerequisite"* according to course advertising. In E-mail advertising from the Fargo list server dated April 8th, only the use of 486s was mentioned. This would seem to be progress. The Salford EMTP revolution finally has reached LEC education, it would seem.

Nanjing, China, should receive current Salford EMTP materials during the second week of May when Yin Yuexin, graduate student at the University of Florida in Gainesville, began a month-long visit of the homeland that he left some 3 or 4 years ago. Your Editor first worked with Mr. Yin in Leuven during October of 1990.

International consulting companies have proven to be useful in recent months in the spread of ATP around the world. Three examples have come to the attention of your Editor recently, and they deserve acknowledgement. First, during December of last year, Rao Atmuri of Teshmont Consultants in Winnipeg, Manitoba, Canada, supplied a visiting customer from Wuhan, China. During April, Dr. Mustafa Kizilcay of Lahmeyer International in Frankfurt, Germany, personally installed and demonstrated ATP for the Egyptian Electricity Authority in Abbassia, Nasr-City, Cairo. Finally, during early May, Alan Myers of Black and Veatch in Kansas City, Missouri, telephoned Dr. Liu to be sure it was acceptable to update an already-licensed client (EWR) in Saudi Arabia. It certainly was. The user group reiterates advice from its six-page form letter: *"The sharing of ATP materials among authorized users is encouraged. If one authorized user has newer or better materials than a second, the first user is encouraged to share with the second."*

More about Electronic Mail (E-mail)

The January issue arrived in Fargo March 2nd, but too late for Prof. Mork to put it on the server during his first visit. He announced availability in E-mail dated March 7th, however. This still beat the post office (mechanical printing and mailing) for the average North American subscriber (the mailing was March 30th). Again, electricity beats mechanical printing and mailing. If speed is important, this is something to remember.

"Someone willing to share ATP materials might be located using the Fargo server. Of course, readers within the USA and Canada have no such need." Thus began a paragraph of the preceding issue (see column 1 on page 9). It is not just persons overseas who might use the Fargo list server to search for someone who would be willing to share EMTP materials, however. This was demonstrated on February 6 by Prof. Charles A. Davis of Western Michigan University in Kalamazoo (USA) issued the following call: *"If you would be willing to share your licensed files with me via INTERNET FTP, please contact me."* For the record, Prof. Davis can be reached at **davis@gw.wmich.edu**

Personal mail to your Editor should not be sent via the Fargo list server if the sender wants a response. This is what happened on April 22nd when all 105 or so of the subscribers received a short note that began: "Dear Dr. Meyer." If the message really is personal, it should be sent directly, not via Fargo. On the other hand, if the message is of general interest (in this case it was), it should be addressed to all readers and not just to your Editor. As a matter of principle, your Editor will refuse to respond to any message that is addressed to him personally, but has been broadcast publicly.

E-mail addresses known to the Fargo list server can be obtained upon simple request. A student at Clemson used the Fargo list server to ask: *"Guido Empereur, What is your e-mail address?"* Why this was done remains unclear (any subscriber has received several messages from LEC in recent weeks). In any case, server mail from Prof. Bruce Mork reminded all subscribers how easy it is to obtain a complete list of names and address. Quoting from Prof. Mork's April 6th message: *"To obtain a complete list of ATP-EMTP subscribers and their e-mail addresses,*

simply send a one-line message to listserv@vm1.nodak.edu: REVIEW ATP-EMTP Within a minute or so, you will receive an e-mail containing this list. Presently, there are about 105 subscribers."

During the winter, misinformation within BPA about Internet reached unreal proportions. It was November 11th that Dr. Liu returned from a BPA meeting at which it was said that BPA already had Internet on an IBM mainframe, and that Richard Wolf, a competent BPA computer expert, would extend this to VAX computers for use by engineers. This was followed by uncertainty: did BPA really have Internet, or just EPRInet from which it could not be separated? During February, Dr. Liu was told that BPA does not have Internet at all! During March, Robert Hasibar was told by an ADP planner that E-mail would be coming. Yet, subsequent inquiries from the computer establishment wanted to know what telephone company our most important contacts used (somehow, this was supposed to be related)! At times your Editor feels a little like Alice in Wonderland.

BPA acquisition of international E-mail service seems to be increasingly likely. Progress may be unreasonably slow, but this was not unexpected. One of six stories of the single-page, April, 1993, issue of *Paulus Newsletter* (internal to BPA) is the following short note: ***"July 22 lunch; Internet : Technical .*** *A technical follow-up meeting has been scheduled for July 22nd with the folks from Internet. As you may remember, at our February 17th meeting, Tony Naughtin did an overview presenta-tion. As we promised, here is the technical follow-up meeting. More details to follow in the next newsletter."* Your Editor's reaction was swift and direct: BPA engineers do not have need of more information **about** Internet; what they need **is** Internet!

CompuServe's DOS shell, which is entered using the **Special** menu of CIM (CompuServe Information Manager), supports Salford EMTP execution! Just recently, following the execution of all test cases, your Editor had tried to run CIM only to be told that *"CIM is already loaded in memory!"* So, by sending EXIT, CompuServe's mail manager was brought back.

Soft fonts will be included in the next major WordPerfect release as explained in a separate story. The importance for E-mail is simple: anyone picking up the WordPerfect disk files by FTP transfer of Internet no longer need worry about incompatible fonts if he has the new WordPerfect. It seems probably that the user group will abandon its present use of external soft fonts, and will switch to some standard, internal, WordPerfect font, once it becomes available.

The first E-mail from the Orient came from Taiwan via the Fargo list server on March 16th. This was from Rong-Shyang Ou of the Institute of Control Engineering at National Chiao Tung University in Hsinchu, who had interest in user-supplied FORTRAN for control-system modeling of TACS or MODELS. In his response, your Editor followed his confirmation of the source-code connection of MODELS with an expression of interest in learning how Chinese language might be handled by E-mail. This is an extension of CompuServe's problem with accented European characters (see the story in column 2 on page 6 of the preceding issue).

The hope for Internet FTP transfers by private individuals was raised in Fargo list server mail by Prof. Bruce Mork of Michigan Tech. His E-mail dated March 10th was entitled *"ftp access to non-internet subscribers."* He wrote: *"Refer to page 749 of Feb 1993 Computer Shopper. DELPHI advertises the capability of doing ftp transfers from over 600 cities in the US. Rates as low as $1.00/hr, 5 hour free trial period, etc. 1-800-695-4005 for information. DELPHI also mentions telnet, so this appears to be a full-featured bridge into internet, but bottle-necked by the speed of your modem."* Does this not sound too good to be true?! Remember, if it does, it probably is! Laurent Dubé looked into this same service some months ago, and decided that it has some disadvantages. It is true that the rate is one dollar per hour if one pays $20/month, which then allows 20 free hours. But any 21st or later hour is $1.80. If one pays $10/month, one is allowed only 4 free hours, and each later hour is $4. For daytime use from Oregon, there are long-distance telephone charges, too. Yet, just as your Editor was becoming excited about possibly making 9600-baud transfers at night, Mr. Dubé revealed the final serious drawback: speed is limited to 2400 baud. I.e., the bottleneck is not the speed of **my** modem, which is used at 9600 baud with CompuServe! To conclude, it is not yet practical for the user group to send files of the GIVE1 and GIVE2 disks of Salford EMTP via Delphi.

Wild-card searching of WordPerfect files using Vernon Buerg's shareware LIST is invaluable as already stated in the last issue (see the beginning of page 5). Be careful to avoid the use of a hyphen in the string of interest, however. After failing to find a hyphenated string this way, further investigation revealed that the WordPerfect storage used some character code other than the usual decimal 45 (hexadecimal 2D), unfortunately. Even this WordPerfect storage is not unique, though. The hyphen of Tsu-huei's name seems always to be represented by hexadecimal A9 whereas her title of Co-Chairman was found in one place to be represented by hexadecimal AA . No doubt about it, the storage of WordPerfect is less than obvious to the casual observer.

Remember LEC still can not accept compressed and UUENCODEd files through its normal address on the IBM mainframe. This is explained in a later story.

Mohan Course : Vancouver July 22- 23

Prof. Ned Mohan of the University of Minnesota will be giving another short EMTP short course --- this one in Vancouver, British Columbia, Canada, at the end of the 1993 IEEE PES Summer Meeting during July. As with offerings of the past two years, only instructors will be using computers, which will be projected for students to watch. New this year is added length (a full two days rather than the one and a half of the two preceding years) and a restriction to power electronics (the course is entitled *"Modeling Power Electronics in Power Systems using EMTP."*) .

The course is scheduled to begin 30 minutes after noon on Thursday, July 22nd, and run until midnight the following day in the Delta Pacific Resort and Conference Center near the Vancouver airport. The mailing address of the hotel is: 10251 St. Edwards Drive; Richmond, B.C. V6X 2M9. Telephone numbers for hotel reservations are: (604) 278-9611 for voice or 276-1122 for FAX.

Faculty is expected to be the same as last summer in Seattle. Professors Mohan, Riaz, and Albertson are from the Electrical Engineering Department in Minneapolis. John Kappenman is the voice of industrial experience at Minnesota Power in Duluth. Finally, Drs. Meyer and Liu will provide the perspective of program developers in Portland.

"Computer Exercises for Power Electronics Education" is the name of Prof. Mohan's soft-cover workbook that explains his own associated set of 64 EMTP data cases. This is a separate commercial product from the University of Minnesota that has sold well in recent years at a price of $295. Well, these materials are included in the course fee of $690. For those who have interest in the subject but have not yet purchased the exercises, this is a real bargain. In E-mail dated Mar. 29, Prof. Mohan wrote: *"Between now and July, I would like to change many of the exercises in the old package of 64 exercises to include more power electronics applications in power systems. In that case, I would also change the name of the package."*

One printed copy of the 800-page ATP Rule Book could be made available at the course by the user group if the need were known sufficiently in advance. This would be an alternative to reliance upon the regular mail for delivery. It would apply to any ATP-licensable person who would not otherwise have access to a copy. Recall that each organization is expected to reprint copies for its own use, should more than one copy be either required or desired.

Salford EMTP disk files could be copied during the course, so ATP-licensable students are encouraged to bring at least four blank (but formatted!) 3.5-inch, 1.44-Mbyte disks. Add a fifth if there is interest in WordPerfect disk files of this newsletter dating back to April of 1990. Add a sixth for unforeseen additional needs such as various shareware programs. Yes, bring an even half dozen!

Prof. Mohan has been busy revising his popular power electronics text book (*"Power Electronics: Converters, Applications, and Design,"* published by John Wiley). Included will be a new chapter on computer simulation. Because of its wider use in school laboratories, the emphasis will be on SPICE. But ATP will be covered, too. For meaningful system-level simulation, EMTP is better, according to Prof. Mohan.

A new 486-based COMPAQ portable computer was already in Prof. Mohan's possession on April 8th when he sent your Editor E-mail. With a color display, built-in trackball mouse, a 209-Mbyte hard disk, and 8 Mbytes of RAM, this latest acquisition should be the computer of preference at the Vancouver short course.

Address **mohan@ee.umn.edu** appeared on the first E-mail to reach Portland from Minneapolis. This was on March 23rd, following complaints from your Editor that continued use of FAX was insanity. It is hoped that the professor now has made the transition, and will have become hopelessly addicted by the time this paragraph is ready by the general public!

Three - Phase Transformer Modeling

The 130-page final report from Prof. Don L. Stuehm of North Dakota State University (NDSU) was reprinted by BPA and made available to the general public as announced in E-mail of the Fargo list server on March 17th. That same day, BPA mailed copies by air to 12 cooperating contacts (including the 7 foreign user groups and 2 individual developers).

The 120-page final report from Prof. Xusheng Chen of Seattle University was reprinted by BPA and made available to the general public as announced in E-mail of the Fargo list server on March 31st. The previous day, BPA mailed copies by air to 14 cooperating contacts (including the 7 foreign user groups and 2 individual developers). Included in the E-mail announcement was the following paragraph, to which there has not yet (as of May 16th) been any response:

The multi-phase use of compensation by EMTP is not proven. Prof. Chen has included this shocking assertion at the bottom of page 59 of his final report: *"10. The multi-terminal Thevenin theorem involving more than one nonlinear element has never been rigorously validated [17]. Even if it is correct, it is not ..."* That reference [17] is to pages 6-58 and 12-7 through 9 of nothing other than BPA's EMTP Theory Book. Readers are advised that this is no casual misunderstanding, since your Editor argued against this very contention during Prof. Chen's

visit to Portland at the end of last year. Well, the dispute now has been made public. Can any reader come to the defense of Prof. Chen, and show your Editor the error of his thinking? If so, please do so. If there is some error in Thevenin's Theorem for more than one phase, it should be explained to program developers as quickly as possible. After all, multi-phase compensation has been a pillar of EMTP architecture since its introduction in the middle 1970s to handle synchronous machine modeling by Messrs. Mike Hall and John Alms of the Southern California Edison Company in Rosemead. That original use may be gone, but the use to handle banks of surge arresters and other nonlinearities remains; and a new interface to MODELS has just been added (see story about Laurent Dubé). If Prof. Chen is right, EMTP structure will be shaken by an earth quake.

Standard test case DC31.DAT was augmented on March 31st by new second and third data subcases that document multiphase transformer simulation. The second subcase is the original GPU simulation of its 3-phase transformer at Stolle Road --- only without surge arresters at Homer City (the far end of the open line). The third data subcase replaces the three single-phase saturable TRANSFORMER components by the 3-phase model of Prof. Chen. DC31CHEN.DAT is disk file of parameters. To speed the simulation, your Editor increased the time step to 50 microseconds (Prof. Chen had used one microsecond). About the transformer modeling of NDSU in Fargo, there would seem to be no need for special data cases to document correct operation. This is because code was not modified, and no bugs were reported during the exhaustive testing by Prof. Stuehm's students.

CHENSPR is the name of an extra utility from Prof. Chen to generate branch cards of the 6-phase Pi-circuit that represents his transformer during the phasor solution. An executable copy is available upon demand for those who want to assure compatibility with data of the time-step loop, and who want to avoid the use of BCTRAN .

NYPA Enhances Salford Graphics

This story is a continuation of the last paragraph on page one of the January issue. It summarizes how Robert A. Schultz of New York Power Authority (NYPA) in White Plains has inspired radical improvements to Salford EMTP and TPPLOT.

Virtual screen plotting is the way Mr. Schultz allowed 768 by 1024-pixel graphics that had eluded the rest of us for a couple of years. Your Editor always had done his Salford graphics directly to the real screen, as illustrated by Salford examples. Unfortunately, this resulted in erroneous wraparound for some hardware (including that at NYPA) for 768-pixel resolution. So, Mr. Schultz tried instead plotting to a virtual screen (i.e., to RAM) using Salford library function OPEN_VSCREEN@. He found that a subsequent copy of the bitmap to the screen using RESTORE_SCREEN_BLOCK@ was undistorted. So, both Salford EMTP and TPPLOT have been given this option (if variable KVIRTU is unity). It normally would not be used without need, however, because the user misses the fun of seeing a plot as it is being drawn.

Saving the text screen for later restoration is a second great idea from Mr. Schultz. It is explained in detail in the first story.

User-selectable screen resolution is new. Your Editor always had relied upon the Salford library routine named HIGH_RESOLUTION_GRAPHICS_MODE@ in order to switch from text to graphic mode. But this involved an inconvenience that was obvious to all: the associated screen resolution necessarily agreed with what the user previously had told CONFIGDB. Unfortunately, a change of resolution within CONFIGDB required rebooting the machine, so dynamic modification by a program was impossible. Well, somehow Mr. Schultz learned of an alternative Salford library routine named GRAPHICS_MODE_SET@ which accepted the desired horizontal and vertical pixels as arguments. This was real progress. This freed Salford EMTP and TPPLOT from the graphic choice of CONFIGDB which no longer is of any concern.

Franklin Delano Roosevelt, President of the United States between 1933 and his death in 1945, seems to have been involved with NYPA , it is interesting to note. Found on two comment cards near the top of a NYPA program PSPLOT.FOR (to plot PostScript) was the following observation: *"NYPA is a state power authority successfully promoted by F. D. Roosevelt before he got around to establishing TVA and BPA at the federal level."*
Yes, FDR was Governor of the state of New York for 4 years prior to his successful campaign for President.

Phase II of the Schultz revolution has to do with possible universality of the fine work that initially was available only to users of Intel microcomputers and MS-DOS or DR-DOS under which Salford DBOS/486 runs. FAX from Robert Schultz on May 11th ends with a summary of *"activities at NYPA."* The first point of this begins as follows: *"1) The complete NYPA version (of) Salford ATP code has been supported on the HP 720 RISC workstation. So far, the screen graphics and postscript plotting are working very well. DC-1 runs flawlessly. The C-like file handling and SPY windows are the only remaining elements to be implemented .... Note that this (was) accomplished with virtually no changes to ATP source code. It was done by implementing the Salford calls in a call wrapper routine which translates the call into a HP-compatible call, including the graphics."* Clearly, this story will be continued.

LEC Account of Marti Metric Bug

The March issue of EMTP News contains a story about the METRIC bug of JMARTI SETUP (see the end of column 1 on page 20 of the preceding issue). More precisely, see the end of the October, 1992, issue (page 20, column 2), since LEC author Guido Empereur makes no mention of the complication noted by Dr. Gary Thomann of PTI. Instead, author Empereur concludes with the following observation: *"This error still existed in the UTPF that was received from Dr. Meyer, early November. Mentioning of the bug indeed appeared in the 4th issue of Can/Am News, 1992, but nevertheless, LEC had to correct the bug in the UTPF it then received from Dr. Meyer."*

Those seven very long (44-cm) pages of FAX from Leuven on January 15th must not be forgotten. The reader is referred to column 1 on page 7 of the January issue for a summary of this, which concerned the same problem using METRIC in Rio de Janeiro. Yet, somehow, in his six pages devoted to this single bug, author Empereur never found the time or space to mention this detail. Why? In January (when it sent its 7 pages of FAX) , LEC did not seem to know about relevant information in our October newsletter. So, in March when it published its story about the METRIC bug on pages 12 through 18 of *EMTP News*, was it unaware of the page-7 paragraph of our January newsletter? If so, how is this possible? What was not mentioned on page 7 is that the paragraph on page 20 of the January issue was part of the E-mail that your Editor sent to Fargo on January 15th for distribution to all subscribers (including LEC) of Prof. Bruce Mork's Fargo list server. For those who are not subscribers, it seems appropriate to document just how bluntly, and in how much detail, your Editor responded to the 7 pages of FAX from Leuven. Reconsider LEC's six March pages in light of the next 4 paragraphs, which are pasted verbatim from our E-mail of January 15th :

Philosophically, program developers in Portland do not appreciate such attempts to work as a committee (in this case, involving 6 parties). This is particularly true when those doing the coordinating are not aware of important background information. For one thing, "committees" waste valuable time. Only one person who knows what he is doing is required to solve a problem such as the present one. No, BPA does not need any "strong motivation to correct this bug." In fact, if those working on the problem in Leuven would simply consult information that has been available to them for many weeks, they would read that BPA already had corrected the problem. The following is a paragraph that has been copied from the end of our October, 1992, newsletter. The WordPerfect disk file has been available from the Fargo server since November 7th, and a printed copy should have been available from Laurent Dube during the annual LEC meeting in Leuven (this was announced in server mail dated November 3rd with title "Dube carries ATP to Leuven"). < < Omit reproduction of the October paragraph > >

In fact, the one line that BPA changed was in precisely the same place as LEC now proposes : below S.N. 8219 of MAIN23. BPA's correction is not the same, but the underlying principle and motivation are similar, and the effect would seem to be identical for usage with LINE CONSTANTS. This is where the investigation at BPA was left early in November. But it is not the end of the story. Already keyed for the upcoming January issue of our newsletter is the following continuation: < < Omit reproduction of the January paragraph > >

As far as these writers can see, LEC has not yet progressed far enough to have discovered this trouble with untransposed lines. The only example shown in LEC's FAX has nothing to the right of "9 10" on the "looping"
frequency card of LINE CONSTANTS, so the LEC data corresponds to a transposed line.

As in the past, BPA would be happy to share its UTPF with LEC. LEC has made no such request for many moons (last summer?), so an update at this time certainly would meet the requirement of reasonableness (ATP materials are available upon any reasonable demand).

End of quotation from January 15th E-mail. It only remains to state for the record that developers in Portland had heard nothing more about the subject until they read Mr. Empereur's 6-page story in the March issue of LEC's publication. Then, on May 6th, E-mail from LEC (Mr. Empereur) contained the following request: *"In order to test code corrections, I would like to have the full DCNEW5.DAT referenced by you in Can / Am News (january issue). My DCNEW5.DAT only contains one subcase, but you refer to subcase number 3. When you send the file by return E-mail, please, keep in mind to send only ASCII code."* The request for only ASCII is believed to indicate continuing inability of LEC's E-mail system, which uses the university's IBM mainframe, to handle compressed and UUENCODEd disk files. In his response that same day, your Editor wrote the following: *"I look at the output of DIR DCN5.DAT and see a date of 12-29-92, so our file has not been changed recently. File size is 15 Kbytes, so would not normally be sent by E-mail. Any message over 7.5 Kbytes involves a surcharge. If you had asked for the data case long ago, and if I had failed to send it, then I would be happy to correct the situation immediately by E-mail. But I am not aware that this was the case. So, the normal means of communication would be a floppy disk by Air Mail from BPA's Mail Room. But you could obtain DCN5.DAT from non-CompuServe users without their paying a charge. What about Prof. Capolino in Marseilles? He is a friend*

of yours, as a faculty member of your short course this summer. Furthermore, he certainly has been sent a copy of GIVE2 since the start of the year." For readers who do not use Salford, it should be explained that the GIVE2 disk contains all standard test cases archived as disk file ALLDAT . ZIP .

Short Circuit Studies Using ATP

FAULTS TO GROUND is a new special-request word that will cause ATP to loop over phasor solutions with different nodes grounded. For each fault, the user lists nodes that are to be grounded (most commonly one or three) on a data card. All regular EMTP output after source input is suppressed. In its place will appear a single table of fault currents with one row for each fault switch of each fault.

Inspiration for the addition of fault modeling to ATP came from BPA's Dan Goldsworthy. In the past, he has been forced to set up many different, separate data cases, execute the program for each, and extract the fault currents of each manually. This is part of carefully building a new data case. At the power frequency, Mr. Goldsworthy will validate the representation by shorting each bus of interest, and compare the resulting fault currents with those predicted by a conventional short-circuit program.

Operation of FAULTS TO GROUND (FTG in abbreviated form) bears some similarity to the operation of FREQUENCY SCAN . Both involve a family of phasor solutions this is ordered by a special-request card. Yet, there are differences, too. The FTG loop is bigger since branch and switch cards are re-read for each fault. In order for this to occur at maximum speed, input must be from RAM rather than disk. This was not an issue for Salford EMTP, which switched to virtual files early last summer (see the final paragraph on page 1 of the July, 1992, issue). But this was an obvious problem for VAX/VMS, which demonstrated a lot of disk noise and slow execution when running FTG. After local VAX expert Randy Suhrbier advised that he knew of no DEC compiler switch to move scratch disk files to RAM, your Editor agreed to program a RAM disk as was used for IBM mainframes during the mid-'80s. In fact, two RAM disks were been programmed in SUBROUTINE WRIT10 for VAX during the morning of April 3rd. The first and biggest (20K card images) is for data of LUNT10; the second (8K card images) is for program text of BLOCKD51.BIN . The sizes are arbitrary, but compilation is required to change them.

A new, third subcase has been added to DC-11 to illustrate the operation of FAULTS TO GROUND on the cascaded connection of Pi-circuits of DC-3. This and the associated Salford EMTP became available on March 5th.

News about Laurent Dubé's MODELS

The new compensation interface for MODELS was tested for the first time on March 11th when Laurent Dubé stopped at BPA with a subroutine MDLTHV that would represent a capacitor exactly. By the end of the afternoon, step one gave the correct, known answer, but the second step was wrong. Two days later, final errors were removed during a telephone discussion of the problem.

User-supplied functions became available in MODELS during Laurent Dubé's visit of March 11th. Previously, there had been talk about user-supplied FORTRAN, which was rather imprecise for two reasons. First, the language is not limited to FORTRAN (the use of "C" is expected); and second, the original capability was limited to SUBROUTINE modules. There do seem to be cases where a FUNCTION module would be substantially more convenient. The argument for an extension to FUNCTIONs was made by Massimo Ceraolo of the University of Pisa in Italy. It was passed to your Editor by Mr. Dubé in E-mail on March 10th. BPA mailed to Pisa object files of the enhanced Salford EMTP on March 12th, and confirmation of successful use with an older Salford linker (version 2.49) was received in E-mail dated April 30th. The message began: "Now all works|" For the record, E-mail comes from **psa@vm.cnuce.cnr.it**

"Connection of user-supplied programs to EMTP using MODELS" is the title of a 13-Kbyte explanation by Mr. Dubé that was broadcast to subscribers of the Fargo list server on March 19th. Although written to answer an inquiry from National Chiao Tung University in Taiwan, the subject is of general interest.

The next PSCC (the Power System Computation Conference of Europe) should include another paper about MODELS . During September, the Summary and Abstract sections were being written by the four authors who were exchanging text by E-mail: 1) Laurent Dubé; 2) Dr. Ivano Bonfanti of CESI in Milano, Italy; 3) Prof. Maria Teresa Correia de Barros of IST in Lisbon, Portugal; and 4) Vincent Vanderstockt of Laborelec in Brussels, Belgium. The preliminary *Abstract* that your Editor saw included several interesting references: *"It also permits direct interfacing of the EMTP program with user-supplied subroutines, external programs, and equipment. Illustrations of the use of MODELS for adding corona-effect simulation in the EMTP and for representing the dynamic behavior of arcs are included."* Incidentally, the tentative title of the PSCC paper was: *"Using the Simulation Language MODELS in the EMTP."*

MODELS and/or TACS initialization follows the phasor solution of the electric network, but it precedes manual redefinition of its initial conditions. This placement was noted by Laurent Dubé in Fargo list server

mail dated April 19th. Should the order be changed?

"Educational use of EMTP MODELS for the study of rotating machine transients" is the title of the 8-page IEEE PES paper number 93 WM 126-3 PWRS that was presented by Prof. Juan Martinez at the 1993 Winter Meeting in Columbus, Ohio. This latest paper would seem to extend to rotating machinery the author's previous simplifications of EMTP use for students. A paragraph of the *Introduction* summarizes this: *"The underlying premise of this paper is that the rotating machine models implemented in the EMTP are very powerful but not user-friendly and they have the same drawbacks that many other models implemented in the EMTP . The new language (Laurent Dubé's MODELS) can be a suitable tool for the development of user-friendly models of rotating machines and the study of simple transient cases."*

Might MODELS be used by BPA's Transient Stability Program? It was during Mr. Dubé's visit on March 11th that Walter Powell posed this question while your Editor and Mr. Dubé were working together before a computer. In response, a copy of the Dubé-Bonfanti ETEP paper on the subject (see the January / February, 1992, issue) was provided, and all agreed that the idea could be discussed later. MODELS may be new, but the idea is an old one. Perhaps a decade ago, Mr. Dubé formally proposed to BPA the use of TACS for the job. Unfortunately, at that time there was opposition by one or two persons who then supervised the development of BPA's Transient Stability Program. But time passes (two key individuals have retired), and Dr. Tsu-huei Liu has since been entrusted with the management. So, the idea of using EMTP technology for transient stability is viewed more sympathetically today. Certainly Mr. Powell, who is a superb program developer, seems open-minded enough about the idea. Of course, user-configurable control system modeling has become substantially more powerful and flexible within EMTP during the past decade. That is, MODELS rather than TACS would be used, for a number of reasons. One of these is the existing ability to use compiled rather than interpreted code. The simulation of transient stability is an enormous burden due to network size (typically hundreds of dynamic generators and thousands of 3-phase busses), so compiled MODELS should be a very important asset.

To benefit from compiled MODELS, it may not be necessary for a user to have a compiler and linker. It was on March 23rd that Prof. Martinez first offered this radical opinion to Dr. Liu and your Editor during a telephone conversation about how MODELS might extend BPA's Transient Stability program. The concept is simple enough to explain. If components (e.g., the model of a voltage regulator or a governor) were predefined, and if these were compiled, anyone later simulating a network could merely USE these (an interpretive connection to compiled code), and maybe receive most of the possible increase in speed. Much if not most of what otherwise would be interpretive (and therefore slow) execution would in this way be shifted to compiled (fast) execution. During an April 1st telephone conversation, MODELS author Laurent Dubé endorsed the idea after saying that he had never thought of pre-defined MODELS from this perspective. Neither had your Editor or Dr. Liu, obviously!

Prof. Martinez has offered an important conceptual perspective (the preceding paragraph) that promises to be useful for the masses of Salford EMTP users, too. The average such user never will purchase the expensive (by PC software standards) Salford FORTRAN compiler, so he never will be able to link object files himself. Of course, control system modeling of EMTP is more varied than such modeling of transient stability (where fixed-configuration exciters and speed governors might be expected to dominate). But some EMTP control logic certainly can be modularized. Both Dr. Liu and your Editor clearly recall Dr. Kurt Fehrle, lecturing on power electronics at the short course in Florida, lament the lack of MODELS devices analogous to the TACS devices. There would seem to be a big incentive for someone (anyone --- not necessarily just program developers) with a compiler to provide a big compiled library that would be applicable to problems of common interest. One can even conceive of different libraries for different classes of problems, if too many components are offered by different, cooperating developers. The more involved the components, the larger the potential speed gain from compilation, of course.

Ease of data listing within a 2-column publication is an advantage of MODELS that the average reader probably has not contemplated. This is illustrated in the PSCC paper. For other EMTP data that uses a full 80 columns, it would be practically impossible to show a listing within one column. But MODELS data is all free-format, so there is no problem using shorter lines (55 columns were used for the PSCC paper). Very handy!

Florida ATP Short Course March 8 -12

Prof. Dennis Carroll gave his 4.5-day EMTP short course in Gainesville, Florida, to a standing-room-only crowd of 23-paying and 2-nonpaying students. This was the week of March 8th through the 12th, 1993. Included among students were three Europeans --- two from different companies in England, and one from Spain. There also were two engineers from the High Voltage Practices section of BPA : nearby neighbors Fred Elliott and Vinh Tran.

Each student had a color monitor and a mouse, so were fully compatible with Salford TPPLOT. Yet, there were minor reliability problems with some mice (the old story of moving parts). Also, a small amount (2 or 3 machines

only) of Intel Erratum 21 was seen (the Salford DBOS error message about needing a D-step chip).

The important E-mail connection was not used once, as it turned out. Yes, your Editor was available to work on problems back in Portland, but none ever arrived --- either by E-mail or telephone. If your Editor wanted to feel indispensable, he was not reassured (joke)!

Five 3.5-inch floppy disks of ATP materials were given to each participant at the end of course. A lot of printed matter also was distributed, including the many hundreds of pages of course notes, the 860-page (it included the section on Laurent Dubé's MODELS) ATP Rule Book, and the 20-page October and January newsletters.

Weather forecasts predicted that a big storm was to arrive from the Gulf of Mexico shortly after the course would end. Dr. Liu flew out of its path without difficulty Friday afternoon. But Dr. Fehrle, who had driven his car from Philadelphia, must have been trapped somewhere. According to Yin Yuexin, Gainesville received a lot of water but no snow (which began not far to the north).

Reading WordPerfect Newsletter Files

Disk files storing these North American newsletters in WordPerfect format are available to any licensed ATP user anywhere in the world. The interested ATP user need only make an FTP file transfer of Internet as explained by Prof. Bruce Mork in the July, 1992, issue (see page 9, column 1). Also, EMAIL.ZIP has this.

JAN90.WP5 is WordPerfect storage of the first issue of the newsletter printed, reproduced, and mailed in Portland. This followed the first five issues, which were largely written by your Editor, but which were published by Thomas Grebe at Virginia Power, recall. The January, 1990, issue was published without fonts or columns using Lotus Manuscript. For the following issue (April, 1990), the user group switched to WordPerfect. Well, while experimenting with Lotus Manuscript, JAN90.DOC was noticed. The conversion to .DCA format was trivial, and WordPerfect accepted this without difficulty. So, the archives of old issues of the newsletter have expanded by one issue! On May 20th, Prof. Bruce Mork of Michigan Tech was sent JAN90.WP5 for placement on the server.

SWFTE Glyphix fonts no longer are used before and after each heading, which was found to be non-portable (see the following paragraph for motivation behind this change). Instead, WordPerfect SMALL and LARGE choices of font are used. The base font need be changed only at the start, generally.

The *Tymes Roman* font of GLYPHIX by SWFTE International Ltd. was used for the preceding 12 issues of this newsletter, which were printed on an H-P LaserJet series II printer. But the present April issue represents a change --- to the *Times Roman* font of DEC, as used with the larger, heavier-duty DEC PrintServer 40 laser printer. It is hoped that contrast of the resulting printed output will be improved, on average. With all of System Planning depending on the DEC printer, the hope is that it will be better maintained.

NEWS . EXE is a special Salford program (i.e., DBOS is required) that was being written last summer to read, search, and print the WordPerfect disk files of this North American newsletter. Although only screen display was being considered, and this was less than perfect (the story titles were never perfectly recognized), your Editor learned enough to convince himself that the task was doable. Work always was delayed for some reason. Most recently, the excuse was the change of fonts. Until this stabilizes, it makes no sense to resume the development. The idea remains unchanged, however. NEWS would offer some special features that would make it better than commercial products for viewing and searching only our newsletters.

A new generation of WordPerfect, version 6.0, is nearly upon us. This important news was first learned in E-mail from Laurent Dubé dated April 1st, which enclosed a news release that Mr. Dubé had obtained from Ziffnet (his access to CompuServe). From the factory in Orem, Utah, this is numbered NWB-446, and is dated March 26th: *".. but the program isn't scheduled to ship until June. ... the new version ... will include fax sending capabilities, sound support, electronic mail, and spreadsheet capabilities ... Users will also be able to fax directly from within Wordperfect, thanks to support for FaxBIOS technology and inclusion of drivers for Class 1, Class 2, and CAS-compliant fax devices. .... Four types of scalable fonts are supported in version 6.0. You can select Type 1, Intellifont, TrueType and Bitstream Speedo. .... The program will also ship with a number of customized scalable fonts. ... Wordperfect 6.0 for DOS will also support color printing .... Grammatik 5, a grammar checking program acquired recently by Word-perfect Corporation, has been integrated into the program. The new version will take advantage of expanded or extended memory if your system has it. Wordperfect 6.0 for DOS has a suggested retail price of $495 for new purchasers. If you already use an earlier version you can upgrade for $129. There's a huge market for upgrades, with an estimated 10 million Wordperfect users. Users of competitive programs like Microsoft Word can switch to the new program for $149. ... it will be announcing a free upgrade to the Windows 6.0 version when is released."*

IEEE COMTRADE . PL4 Files

IEEE PES COMTRADE output of Salford TPPLOT was introduced in the preceding issue (see page 16, column

2). The following writing is a continuation.

Yes, the 16-bit integer alternative (this is BINARY of COMTRADE) to FORMATTED files (ASCII of COMTRADE) has been coded. It was easy because the Salford compiler has the bit-manipulation functions that are required for the packing of any LOGICAL variables (which are called DIGITAL by COMTRADE). On the other hand, how does one know that bit counting by Salford is the same as the bit counting required by the IEEE COMTRADE standard? Verification by some outside organization would seem to be required.

No provision for two or more floppy disks is being made in the initial implementation. It is assumed that creation by Salford TPPLOT will be done using the hard disk, which has no obvious practical limit. Plotting of COMTRADE files normally will be done from storage on the hard disk. In between, for communication via the mail on floppy disks, any user is free to archive or segment the files however he likes. For example, one could first compress the file using PKZIP by PKWare. If the output of this still were too big, copying to 2 or more floppies could be by MS-DOS BACKUP. It is not obvious that such a procedure is compatible with the published IEEE COMTRADE standard, however. If any reader takes serious exception to this assumption, he is invited to send his case to Portland in writing. In the absence of a convincing argument, the single-file assumption will remain unchanged (as explained in the July, 1992, issue, the IEEE working group concerned with EMTP already has missed its opportunity).

The PL4 command of Salford TPPLOT will show any COMTRADE .CFG file provided there is a parallel .DAT file as prescribed by the IEEE standard. The new .CFG file names will be mixed with any .PL4 files of the same directory. Ordering of the mixture will be chronological (depending upon the MS-DOS date and time) as before. Clicking button 2 of the mouse on the .CFG entry will display this text file, not the associated signal file having .DAT file type. For more information about this operation, read the second story of this issue.

Interest in BINARY COMTRADE testing first was revealed to the general public in Fargo list server mail dated March 1st. Three days later, the search was called off as follows: *"BPA's Jerry Nordstrom answered the call for a BINARY COMTRADE file, so this request ... is being cancelled. This writer has been informed that Mark Adamiak of the G.E. relay operation in Philadelphia has agreed to send an example to Mr. Nordstrom."* A floppy disk was received from Mr. Adamiak on April 8th, but it proved to be different than what was wanted.

Dr. Kizilcay's Frequency Dependence

Test cases for Kizilcay frequency dependence were received in compressed, UUENCODEd E-mail from Dr. Mustafa Kizilcay in Frankfurt, Germany, on April 27th. Following cosmetic editing, the four trivial subcases that appear in his article in the March issue of *EMTP News* were appended to the previous 2 data subcases of DC-23 on May 8th. One line of initialization that your Editor previously had forgotten was added to the code on May 8th in order to allow a conventional data case to simulate correctly following one with frequency dependence (Dr. Kizilcay had noted that his 5th subcase was in error due to its position).

A 56-Kbyte WordPerfect disk file corresponding to Dr. Kizilcay's article in the March issue of *EMTP News* was received on April 6th. But this was not sent to Prof. Mork for placement on his Fargo server until May 20th when Salford EMTP and TPPLOT disks to sent for unrelated reasons (correction of 768-pixel graphics).

Dr. Mustafa Kizilcay's paper on low-order network equivalents was scheduled for publication in the March/ April, 1993, issue of ETEP (the European Transactions on Electrical Power Engineering). According to E-mail dated May 14th, 20 copies of the official preprints were mailed to BPA four days earlier. Received on the 17th, these should be distributed by BPA to its primary EMTP contacts along with copies of this newsletter.

Unstable Saturable TRANSFORMER

"News: Unstable 3-winding, single-phase, saturable TRANSFORMER data" was the title of an 8205-byte E-mail message from your Editor that was distributed by Prof. Bruce Mork's Fargo list server on May 4th. Most of the remainder of this story has been copied from that message.

The saturable TRANSFORMER (request word of columns 3-13) may be unstable for certain combinations of parameters, readers are reminded. An illustration from Jerry Almos of BPA follows. Any theoretician who believes he might be able to shed light on this mysterious and troublesome phenomenon is encouraged to consider this or any other realistic example, and share his insight with others.

Instability of the saturable TRANSFORMER is an old problem dating to the middle 1970s. This writer installed the EMTP modeling in 1974 as documented in Volume I of *EMTP Memoranda* (the memo dated 11 June 1974 communicated the associated Rule Book pages to users). Some time later (the mid- to late-70s?), Dick Webster of Pacific Gas and Electric in San Francisco provided on punched cards an illustration of the instability. But over the years, which included both physical moves and changes of computer, the PG&E data was lost. Lack of an illustration then made it difficult to talk about the problem precisely with others, of course.

But now (April of 1993), Jerry Almos of BPA came to this writer with a practical data case that was unstable. Eventually, throwing away just about everything except one 3-winding transformer, one sinusoidal source, and a load resistor, Mr. Almos demonstrated that the data remained unstable. .... That batch-mode plot shows typical, erroneous exponential growth toward the end. .... Characteristic of the phenomenon, the case should be in the sinusoidal steady state. There is no switching. Where and why the erroneous, extra, artificial numerical oscillation begins is difficult to say. The source seems to be numerical noise (roundoff) that somehow is being amplified as time passes. ....

About the transformer, this is a BPA 230-kV, 250-MVA, single-phase device that is part of bank 3 at BPA's Keeler Substation. Printed ASEA documentation dating to 1967 shows the device to be cooled by forced oil, and to have a rating of 250/250/5 MVA (for the 230, 115, and 13.2-kV windings). In per unit on a 100-MVA base, Mr. Almos has computed the following equivalent T-circuit reactances : X-high = -2.0585% , X-low = 4.8895%, and X-tertiary = 22.513% . Note the one negative value, which is typical of 3-winding transformers. For usage with the saturable TRANSFORMER, common sense suggests that this should not be winding number 1. Why? Because the first winding has its leakage reactance
represented as an uncoupled series R-L branch, and a negative time constant L/R is suggested intuitively. Mr. Almos wisely placed the negative reactance in another winding, where it is buried inside the 2x2 matrices of USE AR formulation.

The instability is precarious. Increasing the time-step from 20 to 50 microseconds will stabilize the case. .... The original transformer had a nonlinear magnetizing branch, of course, but that was removed as part of the simplification (the case was unstable with or without it).

To avoid instability of the saturable TRANSFORMER, one can use Type-51,52,53 branches as an alternative. In fact, EMTP will do the conversion for the user. This is the CHANGE TRANSFORMER feature as illustrated by DC-67. Yet, a word of caution should be issued. Mr. Almos's data are in ohms at 60 Hz, note, so XOPT = 60 is required for the conversion program. This can be defined on extra miscellaneous data cards .... Yet, this followed a program change to SUBROUTINE OVER24. Curiously, prior to April 26th, XOPT was equivalenced to the time-step DELTAT. Why this ever was done is unclear today. Printout of the conversion program should document the XOPT value used. .... Users of an uncorrected program should simply key the desired frequency of 60 in columns 1-8 of the floating-point miscellaneous data card.

For the record, Mr. Almos' data is the first practical case of trouble at BPA. During 19 years of usage, production EMTP users never before have complained about the saturable TRANSFORMER, despite its frequent use. Three-phase transformers are uncommon in this part of the country for high-voltages, so more than 3 coupled coils are rarely required. Except for possible instability just now seen, the saturable TRANSFORMER has been
ideal for BPA data over the years.

Gabor Furst outside Vancouver, British Columbia, Canada, has performed a lot of experiments on the subject. In a telephone call May 17th, he was encouraged to share a summary with others via the Fargo list server.

Miscellaneous Intel PC Information

Pentium is known to be the official name of Intel's 80586 microprocessor. Yet, the chip itself is not yet in the hands of the general public. In the March 30th issue of *PC Magazine*, John C. Dvorak provides the following interesting perspective on page 95: *"(Intel) can ship the current revision of the chip as a 50-MHz chip and make some noise about ramping up to 66 MHz. Apparently, the chip works fine at the slower speed. But Intel has the 99-MHz clock-tripled 486 DX3 in the loop and would have to swallow its pride, since it's quite likely that the DX3 would outperform the slowed-down Pentium. Decisions, decisions."* Interesting. A 99-MHz 486 might be the next recommended step for a power-hungry user who prefers performance and value to prestige?

Some 100 million computers have MS-DOS and 20 million have MS Windows, according to Microsoft. This estimate from Microsoft itself was contained in a story by George Tibbits of the Associated Press which was carried on page E4 of the March 14th issue of Portland's major daily newspaper, The Oregonian. Mr. Tibbits writes: *"the stunning success of Microsoft has drawn the attention of government regulators. For more than two years, the Federal Trade Commission has been examining whether the company competes unfairly." Stunning* is right. Both revenue and net profit in 1992 were nearly ten times as big as in 1987. Bar charts show $2.76 billion vs. 350 million for revenue, and $708 million vs. $78 million for profit. From only 13 workers in 1978, Microsoft has grown to more than 11800 today. One of the complaints about Microsoft business practices is that *"it announces products long before it's ready to ship; it's 'fudding' --
spreading Fear, Uncertainty and Doubt about rival products."* Hmmm..., this sounds like standard IBM business practices in the good old days (do you remember early hype about OS/2, and Top View windows?)!

The decline of IBM as leader of the PC world is noted at the start of a column by Bill Howard on page 105 of the May 25th issue of PC Magazine. *"Who controls the*

PC standard? Originally IBM and Microsoft had joint custody, and IBM was the dominant parent. Today it's Intel and Microsoft, and they're equals --- Intel supplanted IBM when IBM went off to found the Micro Channel commune in 1987." Well, IBM received what it deserved for its belated attempt to monopolize the PC world by making its own PC architecture proprietary. Recall that Micro Channel followed 5 or 6 years of open architecture (the original IBM PC, followed by the PC AT). The Micro Channel story has some similarity to what happened to DCG and EPRI in their own bungled attempt to monopolize EMTP : customers have ways of voting with their feet (taking their business elsewhere). Yet, the analogy is flawed. After all, IBM wanted only a **little** money from each customer (an extra thousand dollars?) whereas the EMTP ambitions of DCG and EPRI knew no such plausible bounds. Another difference is that IBM **did** sell a few of its Micro Channel computers (the user group is still looking for the first customer who has paid EPRI advertised royalties for the DCG / EPRI EMTP) ! Remember, it takes really big players to make the really big mistakes that can be traced to greed and arrogance.

The word *Windows* is not yet a trademark of Microsoft. That is the good news in an Associated Press story by Edmund L. Andrews that was carried on page B5 of the February 25th edition of Portland's dominant daily newspaper, *The Oregonian.* Mr. Andrews explains that *"...the federal government has issued a preliminary decision denying Microsoft Corp. a trademark ... In a detailed, 31-page letter issued last week, the patent office sided strongly with Microsoft's opponents. The letter argued at length that the word 'windows' has a generic meaning in the computer industry and was in use long before Microsoft first introduced its product ..."* Amen. Your Editor first saw Apollo windows in 1981, before the first IBM PC was sold!

"AMD to sell Intel 486 clones" is the title of a short Knight-Ridder News Service story that appeared on page B6 of the April 21st issue of Portland's principal daily newspaper, *The Oregonian*. This is the good news for the consumer: impending competition in the 486 market just as there has been for some time in the 386 market. *"Advanced Micro Devices Inc. says it will immediately begin selling clones of Intel Corp.'s 486-type microprocessors, giving Intel its first serious challenge to the most lucrative computer chip monopoly in history. AMD's decision, following a legal victory last week, seems likely to shake up the computing world because it will give computer makers and buyers their first alternative source of chips ...."*

$955 is the advertized price for a complete 486-SX computer capable of Salford EMTP simulation and VGA color graphics. This is local to the Portland area, as advertized by Smith's on page E20 of the April 30th issue of Portland's principal daily newspaper, *The Oregonian.* Except that the SX is weak compared with a regular (DX) microprocessor (remember those famous LEC benchmarks in column 2 on page 11 of the July, 1992, issue), the package is attractive. Included are 2 Mbytes of RAM, an 85-MByte hard disk, both 5.25- and 3.5-inch floppy disk drives, 14-inch color VGA monitor, a 3-button mouse, MS-DOS 5.0, MS Windows 3.1, and finally, one-year on-site service.

$1999 is the list price for a color notebook computer that is 386-based. This offering is from Dell Computer according to a brief menton on page 60 of the May 25th issue of *PC Magazine.* With 2 Mbytes of RAM and an 80-Mbyte hard disk (the minimum size), this should be capable of running Salford EMTP slowly (without a 387). *"The 9-inch VGA display is capable of up to 256 colors and supports simultaneous external display for convenient use in presentations."*

Vision Edit, abbreviated VED, is a shareware text editor that was recommended in E-mail dated April 27th from Dr. Mustafa Kizilcay of Lahmeyer International in Frankfurt, Germany. This is only for users of Intel-based microcomputers that run MS-DOS or DR-DOS, of course. *"I discovered an excellent shareware ASCII editor called Vision Edit (V3.5), which I have been using for 8 months. It is a multi-window, mouse driven text editor with very good features. The registration fee is about $35. It is available from: Andrzej Brzezinski & Marek Kosznik; P.O. Box 2657; Winnipeg, Manitoba R3C 4B3; Canada."* For E-Mail, use **umbrzez 0@silver.cs.umanitoba.ca** The dominant advantage over shareware PCWrite that still is used in Portland would seem to be the ability to handle arbitrarily large files. Documentation from Winnipeg includes the following: *"VED uses all available memory (only for registered users); it is especially useful for users with fast machines and lots of expanded/extended memory; maximum file size is limited only by free disk space;"* That does sound good -- except for the fact that one must pay the $35 to have it (the shareware version would seem to remain deliberately crippled)!

SCROLLIT is the name of a screen scroll-back utility that was mentioned in the previous issue (see the top of column 2 on page 2). Whereas your Editor suggested that more information would follow in the present issue, he has since decided otherwise. The problem is not with what SCROLLIT does, but rather with what it can not do for Salford EMTP and TPPLOT users. If Salford windows are involved, as is mandatory for TPPLOT, it seems that nothing is saved by SCROLLIT. If one has set EMTP for 131-column output, this *wraps around* when sent to a conventional 80-column screen; and it is this broken copy that is saved by SCROLLIT. Finally, the use of display utilities such as Vernon Buerg's shareware LIST produce unnatural-looking history of SCROLLIT. The concept is great, and it works very well for simple commands of MS-DOS such as DIR. But more complicated output may

escape the best efforts of SCROLLIT or any similar program, apparently.

$40 Ravitz Shareware Displays HP-GL

Ravitz Software of Lexington, Kentucky, offers a superb little program named PrintGL for the display of HP-GL disk files on either color monitors or on most printers of interest. Notable features include almost any magnification (factors between 1/10 and 20 have been tried), vertical and horizontal scrolling of the screen display, the control of pen colors (important for screen plotting), and the control of line width and structure (important for hard copy on monochrome printers).

Typical of shareware, PrintGL can be distributed to anyone without charge for trial use. The .DOC file explains: *"If you continue to use it after your evaluation, a $40 registration is requested. This registration covers use by a single person (on multiple computers) or installation on a single computer (may be used by a group of people)."* Payment is to be made to: Ravitz Software Inc.; P.O. Box 25068; Lexington, KY: 40524-5068; USA

Note that PrintGL complements rather than replaces the need for publishing software such as WordPerfect. A writer who wants to include an HP-GL graph as part of a printed page is not helped at all. But the person who instead is satisfied with a separate plot should be very pleased. To begin with, PrintGL is far smaller (the .ZIP file occupies just 105 Kbytes) and cheaper ($40 vs. $200). As with PCWrite, the shareware status of PrintGL makes it invaluable for use at short courses (it can be given to students without licensing or payment). Scrolling and magnification allow the examination of details that could not be detected using WordPerfect. Finally, it is quicker and more convenient to use PrintGL --- if just the display of HP-GL disk file files is of interest. On the other hand, PrintGL is not a publishing program.

Although PrintGL is an American product, it is a European user of PCs who must be credited with calling your Editor's attention to this excellent tool. In E-mail dated February 17th, the product was recommended by Dr. Mustafa Kizilcay of Lahmeyer International in Frankfurt, Germany, who offered to send a sample copy. Received during the first week of March, this rapidly made believers of your Editor and Dr. Liu, the latter of whom took a copy to Florida for further demonstration and distribution at the short course the following week.

Experimentation on disk file HPGL3.LIS can begin with the command **PRINTGL HPGL3.LIS /FV /MF1.0 /CBRGYMC /W222222** where /FV requests VGA graphics, the magnification factor (MF) is unity, pen colors following the /C are blue (B), red (R), green (G), yellow (Y), magenta (M), and cyan (C), and pen widths are all 2 pixels. These are the default controls that can be found in TPPARAM.HLP for Salford TPPLOT use.

Free Homemade HP-GL Interpreter

An alternative to Ravitz PrintGL is available free of charge for viewing HP-GL files that are produced by either Salford EMTP or TPPLOT. A preliminary, primitive, prototype version of this software first became available in Salford TPPLOT, which runs on Intel PCs, on April 23rd. The introduction in the second story of this newsletter pointed to this separate story for details.

First, understand that your Editor's code is **not** a general replacement for PrintGL by Ravitz Software. Whereas PrintGL is designed to accept a wide variety of HP-GL commands from an arbitrary source, the free code of TPPLOT has been designed to handle only the restricted HP-GL that is produced by either Salford EMTP or TPPLOT, and to display it only in a way that is of concern to the average TPPLOT user. It is not possible for your Editor's code to produce alternative PostScript output, for example (PrintGL is said to support such printers). Etc. (PrintGL does many fine things that your Editor never would attempt). Remember that your Editor wrote the free code of TPPLOT with a much more limited purpose in mind. The importance of this to TPPLOT users is that the free code has some critical advantages.

Dynamic zoom is the dominant advantage of your Editor's code over Ravitz PrintGL. Dynamic panning is not an issue, since both codes do this in response to the arrow keys. For zoom, Salford TPPLOT will increase the magnification by 50% (default value of parameter FMAG, which is accessed by floating-point index 91) in response to the **Plus** key, and decrease it by the same amount in response to the **Minus** key. The **Esc** key provides a return to original scaling and centering. The fractional displacement of arrow keys is 25% (default value of parameter FPAN, which is accessed by floating-point index 90). Such pan and zoom are of extra value for window plots, which typically are smaller than usual. A key-ahead buffer exists, but any such yet-unprocessed zoom or pan requests can be cancelled by **Esc** at any time (action is instantaneous). There is no limit to how many times the **Minus** key can be pressed to shrink the plot (eventually it collapses into a single pixel). But there is a 16-bit limit on use of **Plus** to increase magnification. To prevent numerical overflow, the program limits the power to 32767 divided by total screen pixels for the direction of interest. Using standard 480 by 640-pixel VGA as an illustration, 32767 / 480 = 66.7 is the maximum vertical magnification. Similarly, 32767 / 640 = 51.2 is the maximum horizontal magnification. The 16-bit integer

interface of Salford graphics can be blamed for this restriction. Yet, it is of no practical consequence. Using standard VGA, a single digit of the horizontal-axis labeling of an HP-GL file that has been produced by Salford EMTP can be expanded so that it exceeds the screen in height!

The **<CR>** key is used to end graphics by a return to the HP-GL prompt of the FILE command. This involves a switch of the screen from graphical mode to text mode, of course. Any scaling of plot frames will be lost in the process.

The **F9** function key can be pressed at any time in order to save a screen bitmap for subsequent display and/ or manipulation (including output as a .PCX file) by the BITMAP command. Yet, the user is advised not to save the final screen contents this way since the program will do this automatically, anyway. The automatic saving of the final graphic screen is comparable to what began with the FONT subcommand of the LABEL command.

Significant zooming of the HP-GL interpreter can most conveniently be ordered by the mouse, which uses rubber banding to allow the user to define his window size and location dynamically. Pressing and releasing button 1 defines either the upper-left or the lower-right corner of the zoom window. Then, movement of the mouse grows or shrinks the rectangle by defining the opposite corner. If the size is right but positioning is poor, hold down button 1 and move the mouse to displace the rectangle (release button 1 when satisfied with the new position). When both size and position are satisfactory, click button 2 to perform the rescaled and shifted plot. To abort the rubber banding (e.g., to release a poorly-selected corner), press any key. Finally, remember that **Esc** will return to original, default scaling. This is common operating procedure: one zooms in on some detail using the mouse, and then **Esc**apes back to the original scaling once that detail has been understood. The mouse can only zoom in, note; it provides only **uni**directional control.

Initial scaling is performed automatically so that the entire plot nearly fills the screen. Not included in this computation, however, is any text that extends to the right beyond the curves, grid, and horizontal axis (if any). This is different than Ravitz PrintGL, which will not clip such text --- presumably because it does not have such intelligence (it does not know what TPPLOT knows: the curves are the element of primary interest). Thanks to automatic scaling, it was not necessary to modify any scaling and offset convention of either Salford EMTP or TPPLOT. For reasons of continuity and consistency, these remain unchanged.

Printing of a zoomed and/or panned screen display is possible. The result of pressing the **F7** function key will be a disk file for Epson dot-matrix printers. Similarly, pressing **F8** will result in a disk file for H-P Laserjet series II laser printers. Comparable to such output from Salford EMTP, such disk files for printers will be named TPPPAPER.001, etc. There should be no confusion as to which is Epson and which is not because file size provides unique identification. While creation of the disk file is in progress, a rubber-banded (emaciated font) message such as "**F7 ==> writing to disk file TPPPAPER.001**" will be seen in the middle of the screen to reassure the user that his request is being processed.

Use **Page Up**, **Page Dn**, **Home**, or **End** in order to consider other members of the HP-GL family. This is the same operation as has been used for more than 2 years to call up RAM-stored bitmaps. The same **Slot X** message in the upper right corner is used to remind the user which member of the family (in order of MS-DOS DIR display) is being displayed. Although other enhancements came later, this basic paging first became available on May 2nd.

The pounds sign **#** is used to fix scaling of only the current HP-GL slot. Typically this only would be done following some creative use of zoom or pan to change the appearance. Without a request to save screen appearance, scaling would be lost as soon as the plot left the screen (most commonly as the user switches to some other slot). But the **#** sign will remember the current scaling through changes of slot (although not through a **<CR>** that exits graphic mode). When a user later returns to the current slot, appearance should be exactly as it was when the **#** sign last was pressed. The user will see acknowledgement of such use in the form of a big **#** in the lower left corner. About appearance, the same font and color are used for this (and also for the **%**, **@**, and **$** signs of following paragraphs) as are used for "Slot XX" labeling in the upper-right corner.

The percent sign **%** is used to fix scaling of all slots at whatever is in effect for the current slot at the time **%** is pressed. Typically this would be used with a family of similar plots. The user first would adjust one, and then he would request that all others be adjusted comparably with regard to pan and zoom.

The "commercial at" sign **@** is used to cancel any unnatural scaling and return to the initial, automatic scaling for all slots. This is the reset key that undoes all previous **#** signs, then.

The dollar sign **$** is a binary toggle to and from incremental adjustment of the magnification and offset of the HP-GL display. There is a factor of ten difference between the regular (original or starting) mode and this finer, incremental mode of adjustment. For example, the default change of magnification is factor FMAG = 1.5 , which becomes 1.05 in incremental mode. There is a corresponding change in the offset: from a default value of

25% of the screen (which corresponds to parameter FPAN = 1.25) to 2.5%. While in incremental mode, the user will be reminded by a big **$** in the lower-right corner. A second **$** will cancel the first if it is issued before the slot is changed. If no such second **$** is pressed, there will be an automatic, implied end of the incremental adjustment mode as the slot is changed.

Pressing the **F1** key at any time will fill the screen with a summary of the preceding information. In order to avoid the annoying shaking that accompanies any switch to text mode (for an expensive, modern, digital monitor), the display of information is done in graphic mode. When the user has read enough, he presses any key; the screen then will be erased, and the previous plot will be redrawn.

A family of 9 sample files named ATPHPGL.* have been included with the TPPLOT.ZIP file for experimentation. Despite the names, these do not all come from Salford EMTP. Included is an example of window plotting (the .008 file was produced by an @FIVE.WIN command of TPPLOT) and an example of conventional TPPLOT use (the .009 file is from TPPLOT applied to DC4F.PL4) .

Miscellaneous Small Items

TCSC of G.E. in Schenectady has progressed since the previous mention (see column 1 on page 20 of the preceding issue). A TCSC-enhanced version of Salford EMTP finally was received at BPA on May 10th by Priority Mail from Dan Baker. This implementation in Salford EMTP is understood to have been funded by EPRI (associated contractual details were responsible for the delay). Next step: source code for VAX / VMS was sent from BPA to G.E. by Federal Express on May 13th.

DEC Alpha time spent in the time-step loop for DC-1 was stated to be *"about 10 sec"* in the previous issue (see page 20, column 2). Since then, Randy Suhrbier has provided a more precise figure: 10.34 seconds. Also, it should be reported that Mr. Suhrbier tried to optimize the compilation, but reported that this did not seem to affect the speed at all. Others have expressed interest in EMTP for DEC Alpha. Bruno Ceresoli of the Italian ENEL expressed interest in E-mail dated April 5th, and your Editor responded the following day with information that such materials could be obtained from BPA .

Any transposed Marti line of more than 3 phases failed to have its data read beyond the third phase. Developers in Portland first were notified of this trouble on March 20th by a telephone call from Alan Myers of Black and Veatch, a consulting company in Kansas City, Missouri. Execution ended with an extraneous KILL = 6 error message complaining about faulty reference branch usage. Well, Dr. Liu corrected the error the following day, and a 2nd data subcase was added to DCNEW-7 on May 9th to make sure such unusual data continues to run. Nothing more than a continuation from the phasor steady state is involved, using the branch cards created by DCNEW-3 (see the $INCLUDE reference to DCN3B.PCH) .

$LISTOFF masked error terminations prior to March 23rd. So did suppression of the listing of data cards for a Marti frequency-dependent line. The latter of these situations was particularly confusing since the user may not have known about the suppression of output (it is the default choice of JMARTI SETUP) . So, one decade late, your Editor decided to issue an automatic $LISTON in SUBR29 immediately prior to output of any error message. Now, fatal error message always will be seen.

Signals that propagate on the steel rails of a railroad can be simulated using EMTP. This is the fascinating new application that first was suggested to your Editor during early February by Stuart McKay of Toronto, Ontario, Canada. Collaborating with someone in England who has interest in the London Underground, Mr. McKay announced by telephone on April 7th that he had switched from LINE CONSTANTS to CABLE CONSTANTS . His latest problem and question is whether conductance to ground (substantial) could be added to the distributed modeling. Your Editor had suggested lumped modeling at the interconnection points of his Pi-circuits.

The University of Waterloo in Ontario, Canada, has acquired LEC ATP materials for Sun on behalf of the Can/Am user group, which does not itself handle this alternative. According to E-mail from Robert Sarfi on May 11th, LEC's *"ATP5 and TPPLOT3 are now installed on a Sparc2, and will soon be installed on two Sun Classics."* There was some concern over slow execution (could Sparc2 be slower than Salford EMTP on a 50-MHz 486?). Possible distribution of such Sun ATP materials to others via FTP transfers of E-mail now is being considered. This would be the really novel part, if it occurs. In E-mail dated May 12, your Editor vetoed the idea of using anonymous FTP. He asked: *"... could you not push files personally to an individual user after first being assured that the person really is licensed?"*

Preliminary success with ATP for CDC has been reported by Harald Wehrend of the University of Hannover in Germany. This is in E-mail dated April 22nd. The story began six months ago (see pages 13 and 14 of the October, 1992, issue). But space is so limited, and details are not yet know, so the completion will be delayed for 3 more months (see the July issue).