MICROCOMPUTERS AND THE HP 3000:

AN ISSUE OF COMMUNICATION

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INTRODUCTION

The central theme of this paper is the consideration of communication issues important to the HP 3000 user selecting a microcomputer to be used as an integral part of their HP 3000 environment. The main issues that will be explored are 1) terminal emulation, including V/PLUS compatability and HP 2622 emulation, and 2) ASCII and BINARY file transfer. Specific references to the HP 86/87, HP 120/125, HP 150, HP 200, Direct 1025, Direct 1625, and IBM P.C. computers and the extent to which these machines meet the needs of HP 3000 users will be considered.

The issues involved in selecting a microcomputer are as numerous as user applications, but one issue which is crucial to HP 3000 users is communications. I will address two microcomputer communications issues which the available hardware/software products have address to varying extents. These issues are terminal emulation ad file transfer capabilities.

Most microcomputers can communicate with the HP 3000 as a dumb teletype style terminal with available communications software or user written software and many can download ASCII files. I have therefore chosen to review microcomputers which have expanded capabilities beyond these (i.e. VPLUS/3000 block mode communication and/or binary file transfer).

Because of time constraints and hardware/software availability I have not reviewed the HPCOM by System Automation Corporation of Silver Spring, Maryland. HPCOM is an HP 26XX emulation program for the Convergent Technologies microcomputer. Alleyn-Day International of Berkeley, California produces Personal-VIEW; a VPLUS/3000 compatible terminal emulator for CP/M based microcomputers.

HP 86/87

TERMINAL EMULATION

The HP series 80 microcomputers are the oldest of the microcomputer systems which were evaluated. This factor contributed to some communications limitations which are discussed below. The 80 Series uses a HP proprietary processor and operating system in ROM. HP 2622 emulation is provided by HP through its' TERM80 program. This program requires a Z80 CP/M card and an RS232 interface card which may be purchased optionally.

With this hardware/firmware/software package the user can almost emulate an HP 2622. One problem is that the HP 86/87 screen displays only 24 lines. Because the HP 2622 has 26 lines, 24 display lines and 2 lines for function key labels, TERM80 allows you to toggle the function key displays on and off. When executing VPLUS/3000 applications which use the function keys this toggling becomes tiring. In character mode with the function keys displayed and the prompt on the 24th line you can't see what you are typing because the function key labels override the normal screen.

I ran several non-VPLUS block mode programs such as QEDIT, and HPToolset without any errors. However, the only display enhancement supported is inverse video. Half-bright, underline, blinking, and security enhancements do not work. The line drawing set available for the HP 262X terminals is not supported with the HP 80 terminal emulation. While the baud rate is configurable at 110 to 9600 bps the actual maximum speed is less.

Although the configuration screens for TERM80 are very similar to the HP 2622 terminal the keyboard is significantly different. There are several important keys which are not on the HP Series 80 keyboard which require the user to remember the double keystroke used to implement the break key, escape key, enter key, aids, modes, and user keys. Several of the editing keys also require double keystrokes and on a few occasions I found myself deleting lines instead of characters while I was becoming familiar with the keyboard.

All keys are typeamatic and when holding down a key it was displayed nearly as fast as the 262X terminals do except when the function keys were displayed. In that case the character was repeated much slower as the function key labels were being flickered on and off.

FILE TRANSFER

File transfer is supported through the Data Communications Pac. This program runs under the HP 80s' native operating mode. One of the first limitations this poses is that files transferred to the HP 80 cannot be used with CP/M applications since the disk formats for the two systems are different.

The transferred files are created with a file type of DATA and with 256 byte records. When I listed these files with the Data Communications Pac, carriage returns and line feeds were not interpreted which caused the records to be wrapped around the screen.The records were not easily readable and I was unable to edit them since files are created in native mode.

The Data Communications Pac may also be used as an asynchronous terminal emulator. This allows configuration of an external printer which may be logged to, baud rates configurable to 96<0 bps (actually runs much slower), DC1/DC3, ENQ/ACK protocol, and error checking.

HP 120/125

TERMINAL EMULATION

The HP 120/125 comes with Block Format/125. This program allows the user to run most VPLUS/3000 applications. The problem with this program and the HP 120/125s' terminal emulation in general is that the terminal emulation code is not the same as a standard HP 2622 terminal and it is not stored in ROM.

Because it does not emulate a standard terminal, some third party software packages and HP software packages will not run. I tested this program using QEDIT by Robelle, HPToolset, and HPSlate. HPSlate required me to select a supported terminal since the HP 125 is notrecognized, it allowed me to continue, and finally told me I had only 4K of terminal

memory and that 12K was required to run HPSlate. While the HP 125 has approximately 9400 bytes of screen memory (more than twice that of the HP 2622) when Block Format/125 is loaded the available memory is reduced to about 3760 bytes of memory, less than the HP 2622. The only full-screen editor I was able to use with the HP 120/125 was TDP. (Using TDP I specified that I was using an HP 2622.)

Block Format/125 only allows one display enhancement per line. When Block Format/125 is loaded it traps the communication and interprets the escape codes required. Because of this implementation, communication with the HP 3000 is significantly slower when Block Format is loaded than it is when the communications code in ROM is used. The code in ROM also does a better job as a terminal in that all

four display enhancements are interpreted correctly and any combination of the four enhancements may be displayed on any given line of the screen.

Another problem inherent in RAM-based block mode emulation is that if at any time you wish to run an application on the HP 120/125, such as Series 100/DSN/Link, you must re-load Block Format/125. This becomes a time consuming when you are alternating between applications having to re-load Block Format each time.HP has alleviated this problem to a certain extent by allowing you to load the block format code from the HP 3000. Using this method the user runs a program on the HP 3000 which downloads the block format code, located in data files BFDATAA.PUB.SYS and BFDATAB.PUB.SYS, into the HP 120/125.

The HP 120/125 has the same screen display and keyboard as the HP 2622.It differs in its' configuration menu and options.The HP 120/125 does not have the memory lock feature. The MODES keys are the same as those on the HP 2622 terminal with two exceptions. The function key normally used for the memory lock key stores a 'LOAD OP SYS' key which is used to switch between remote mode and local CP/M mode to load the CP/M operating system.There is also a 'LOCAL OP SYS' key in place of the standard block mode key. This key toggles in and out of the CP/M operating system mode. The line drawing set available on the HP 262x terminals is not available on the HP 120/125, nor can you use

any display graphics. The arrow keys cause you to scroll through terminal memory when you attempt to move beyond the top or bottom of the screen instead of wrapping around the screen as the HP 262X terminals do.

FILE TRANSFER

File transfer on the HP 120/125 is provided by the Series 100/DSN/Link program. This program supports the transfer of ASCII and BINARY files between the HP 3000 and the HP 120/125. It also allows the user to log his session to a local printer and/or disc file.Files with record sizes of up to 512 bytes may be transferred. Files up to the storage capacity of the disk drive may be downloaded to the HP 120/125.

To support binary communication with the HP 3000 DSN/Link is supplied with a program for the HP 3000, LINK100.PUB.SYS, which the user must transfer to the HP 3000 upon installation of DSN/Link. When uploading HP 3000 program files which are stored on the HP 120/125 you must set the record size in DSN/Link to 256 since this field is specified in bytes. Once the file has been uploaded the user must re-copy the transferred PROG file into the proper HP 3000 PROG file format. The Series 100/DSN/Link manual does not document these commands. To execute the program DEMOPROG having uploaded it to the HP 3000 from the HP 120/125 you must issue the following MPE commands:

```
:RENAME DEMOPROG,TEMPPROG
:FILE DEMOPROG;CODE=PROG;DISC=,1;REC=128,1,F,BINARY
:FCOPY FROM=TEMPPROG;TO=DEMOPROG;NEW
:PURGE TEMPPROG
```

One problem I have encountered in transferring files is the termtype specified on the port you are using to access the HP 3000. Some modem ports on the HP 3000 are set to termtype 9, allowing non-ENQ/ACK terminal access. When attempting to transfer files on ports with termtype 9 I have received a "WAITING FOR HOST RESPONSE" message which would not go away. To solve this problem I set the termtype to 10 (Note: this is not documented in the Series 100/DSN/Link

manual and may have been corrected in a newer version of the software). Although BINARY file transfer with error checking is supported, I have had reliability problems when transferring binary files over standard telephone lines (most likely due to bad phone lines).

Series 100/DSN/Link also allows BINARY and ASCII file transfer between other Series 100 microcomputers including the HP 150.

HP 150

TERMINAL EMULATION

Of all of the microcomputers I have reviewed the HP 150 is the most sophisticated in terms of communication with the HP 3000. It emulates the HP 2623 graphics terminal including full VPLUS/3000 compatability and tektronix graphics The HP 150 also has enhanced capabilities beyond those of the HP 2623.

One of these enhanced capabilities is the security field enhancement which allows specification of a field in which the characters typed are transmitted but not displayed on the screen. The HP 150 also has a smooth scrolling feature.

The other obvious enhancement is HPTouch. This is a powerful feature which may be accessed from the HP 3000 through a set of escape code sequences.One problem with this is documentation of these sequences. The HP 150 is supplied with a terminal reference manual and a users guide. The HP 150 terminal reference manual documents the terminal capabilities including a clear but incomplete section on the escape code sequences. It would be appropriate for the touch screen escape code sequencies to be documented in this section but they are unreferenced.

The documentation on the escape code sequences which I did receive from the HP 150 PICS

was incomplete and in conflict with the escape code sequences used in the BASIC program in the October 1983 issue of BYTE magazine. Documentation concerning the I/O system has also not been available so far.

The HP 150 has a very nice keyboard which may become a HP standard. The keys have a good touch and the roll-over is fast. One problem I encountered was the placement of the escape key next to the left-hand shift key. The more casual user may encounter 'enhanced' problems by accidently hitting escape key while typing. The new keyboard does not have AIDS or MODES keys and uses instead several combinations of the shift, control, user, and menu keys to arrive at the same results. You can scroll through approximately two pages of display memory. You cannot, unfortunately, use the standard 256K of RAM as display memory.

FILE TRANSFER

File transfer is facilitated through Series 100/DSN/Link for the HP 150. This program functions the same as the the HP 120/125 version of Series 100/DSN/Link and is supplied with a new version of LINK100 for the HP 3000. LINK100 must be installed on the HP 3000, replacing any existing version of this program.

HP 200

TERMINAL EMULATION

The HP 200 has one terminal emulation package at the time of this writing. This package is the Asynchronous Terminal Emulator and it is a subset of theHP 2621/non-block mode terminal. There will soon be available an HP 2623/block-mode graphics terminal emulator which will address the concerns of the HP 3000 users.

The new HP 2623 terminal emulator will most likely require at least 512K bytes of RAM. It will not support the line drawing set, display enhancements, hard reset, self-test, nor frame rate. This emulator will also only display the top line of the function key labels since there are only 25 lines on the 9816 display.

FILE TRANSFER

The Asynchronous Terminal Emulator (ATE) also allows ASCII file transfer between the HP 200 and the HP 3000.One nice feature is when the user mis-types a command line it allows him to position the cursor back on the line in error, correct the line, deleting the colon prompr, and press the execute key to retransmit that line. The ATE is supplied with an environment disc which contains portions of the Pascal operating system, I/O configuration, and other Pascal system and library routines required to run the application.

The new HP 2623 emulator will also support ASCII file transfer. Neither the ATE nor the new emulator will support BINARY file transfer.

DIRECT 1025/1625

TERMINAL EMULATION

Although the Direct 1025 and Direct 1625 have differing CPUs' and operating systems (Z80/CP/M and 8088/MS-DOS) Direct has informed me that they are functionally equivalent in their communications capabilities.Due to hardware/software availability I was unable to review the Direct 1625 but the comments concerning the Direct 1025 should apply to the Direct 1625 as well.

Both systems support emulation of the HP 2622 and HP 2645A terminals. This is implemented in ROM and is easily selectable through the setup/configuration screen.

The Direct 1025 has one setup screen which incorporates both the terminal configuration options and data communications options which are standard on the HP 262X terminals. The user may select baud rates between 50 and 19.2K bps.620 bytes of RAM are available as a buffer for the communications port or as a typeahead buffer. The user can select between 240 and 620 bytes of this memory to be used for this buffer the remainder of which will be used as a type-ahead buffer in local CP/M mode.

Direct also allows specification of a scroll rate through the setup screen. The three options available are JUMP, SMOOTH, and SLOW. The jump option displays characters to the screen as they are received. The SMOOTH and SLOW rates both provide easy to read smooth scrolling at two speeds.

Directs' implementation of VPLUS/3000 block mode is very good with some minor Exceptions. When developing systems for non- technical users you do not usually want to allow them access to the configuration screen or modes keys. VPLUS/3000 disables the AIDS and MODES keys by default but the Direct 1025 still allows access to their setup screen so that the user could alter his configuration. Access to the terminal test, block mode, and format mode keys is also allowed. All of the display enhancements worked but I encountered one problem with the security enhancement. Security fields defined in a VPLUS form did not work but the escape code sequence for the security enhacement did work when I was in character mode.

I have had no problems with applications using several combinations of the block mode, format mode, and line/page mode. These included HPToolset, QEDIT, and TDP.The only application I found which had problems was HPSlate. This problem was a firmware bug which Direct responded to promptly by calling my local service representative.

One of the most convenient features which Direct provides that none of the other manufacturers provide is viewing 132 characters per line on the screen at one time. This feature can be extremely valuable to programmers coding and testing reports and to users who wish to view existing reports on-line instead of waiting for batch reporting schedules. Use of the 132 character line is nicely implemented so that the user can toggle between 80 and 132 characters with a keystroke.

One drawback to the Direct keyboard is that a special function key must be used like a control key to perform the standard HP editing functions including the break key. The keyboard has 86 keys, including a numeric keypad, which also performs editing functions, and including the eight standard HP 262X function keys.In comparison, the HP 262X keyboard has 100 keys including numeric keypad.

FILE TRANSFER

Direct allows transfer of ASCII and BINARY files between the Direct 1025 and the HP 3000 via their Link/1025 program. The Link/1025 package comes with two programs. One program runs on the Direct 1025 and the other runs on the HP 3000. When you run Link/1025, it checks to see if the group you are logged onto has the Link/1025 sister program, an SPL program that runs on the HP 3000.If the sister program is not in that group, it uploads the program from the Directand begins transferring the file.

LINK/1025 worked well with no problems and I was pleased that it automatically determined whether its' sister program was needed and transferred if required. Because the program resides in the users group I was able to begin using the package earlier that other packages which require the system manager to install the program.

IBM PC

TERMINAL EMULATION

Having had numerous requests for access to our HP 3000 system from users with IBM PCs', I have reviewed as many block mode terminal emulating programs for the IBM PC as possible. The programs which I have reviewed include; PC2622 by Walker Richer & Quinn, Inc., Seattle, Washington; PCCOM marketed by DWJ Associates, Inc. of Ridgewood, New Jersey; and VDTE: Video Display Terminal Emulator by Inner Loop Software of Los Angeles.

The IBM hardware has some physical limitations which each vendor had to account for. The IBM screen displays 25 lines while the HP 262X terminals use 24 lines plus 2 lines for the function key labels for a total of 26 lines.Each of the vendors accounts for this descrepancy in different manners. The other limitation is the keyboard. Since there are significant differences in the placement of keys, a logical easy to to understand mapping of these keys is important for ease of use.

PC2622 initially displays a help screen which lists the keys used to display the AIDS, MODES, and USER keys, including the HP 262X special keys and there equivalent on the IBM keyboard. One of the important differences between this program and the others is initially apparent. The difference is that there are AIDS, MODES, and USER keys which are similar to those on the HP 262X terminals and that when VPLUS/3000 disables these keys (by default) access is correctly disabled on the IBM PC. The other vendors do not support this.

PC2622 allows the user to save differing configurations in separate configuration files which will also store pre-defined user keys. This allows the user to store HELLO commands and if you have a built in DC Hayes Smartmodem you can store a phone numbers in the function keys and automatically dial a computer with the stroke of a function key.

The configuration is flexble and easy to use. The baud rate is selectable between 110 bps and 19.2K bps but the performance is as expected less than the selected rate. The device control specifications are more flexible that the HP 2622 since they allow the user to send data to an external printer, remote system, or to disk.

One nice feature which PC2622 has that the others don't is a user configurable record width. This allows the user to scan files with record sizes over 400 bytes viewing 80 characters at a time.The user scrolls horizontally in either direction with one keystroke.

To resolve the shortage of one disslay line on the PC the user may toggle the function key labels between two lines, which displays over the 24th line (you can still scroll the screen up a line to view the 24th line), and one line, which displays all 24 lines and the first of the two function key label lines, and no function key labels. This solution is flexible and the labels are toggled quickly.

All of the display enhancements worked with the exception of underline which is substituted by a yellow background on color screen monitors. Included in the enhancements supported was the security enhancement which is not supported on the HP 2622 but did work with PC 2622. The display functions enhancement is supported but it displays a graphics character set instead of the abbreviations displayed by HP. This program is also one of the few which supports the line drawing set. As far as I could tell PC2622 used all of the availble RAM as display memory which allows for more memory than any of the terminal emulators.

I successfully executed several full screen editors including QEDIT 3.1, QEDIT 3.1.8, HPSlate, and TDP.HPToolset locked up when it attemted to load the softkeys. (I found this package exceptionally well designed and it surprised me in several of its capabilities.) Complete, well-written documentation would be welcome.

PCCOM by David McGrew is stated to be a "HP 2382 terminal emulator".However, it did have some problems.None of the full screen editors I tested, including HPToolset, HPSlate, TDP, QEDIT 3.1, and QEDIT 3.1.8, worked dor did FORMSPEC or ENTRY. The formspec fields, and all fields defined in inverse video, allowed only one character on input in each field.On all of the block mode applications I ran the function keys were being ignored almost completly (attempting to get any of the softkeys to work I did lock the keyboard several times).Security fields, not supported on all block mode terminals, did not work using PCCOM, although they did work on the other two products for the IBM PC.

There appear to be serious problems in PCCOM's emulation of the HP 2382, the most frustrating of whichwas locking up thU IBM P.C. and lose of my session on the HP 3000 several times while attempting to use HP 2382 compatible software products.Repeated soft resets would not unlock the keyboard nor could I break out of the program since the break key is not implemented.I finally had to turn the

IBM off and execute PC2622 to break out of my locked session with the HP 3000.On several occasions my line to the HP 3000 had been disconnected.

The third product I tested was VDTE (Video Display Terminal Emulator) which is marketed as a VT52, HP 2648, and HP 2624 terminal emulator by Inner Loop Software. All of the testing I conducted in HP 2624 mode.This program has the least similarity to the HP 262x terminals.The configuration options are accessed through a main menu which is available at any time, whether the AIDS, MODES, and USER keys have been locked or not.

VDTE would not execute any of the above mentioned full screen editors but would run my VPLUS/3000 applications including FORMSPEC. It also supported the security field enhacement.Not all combinations of the display enhacements worked but in every case if a field was specified with security on this enhancment worked.

FILE TRANSFER

Each of the programs supported ASCII file transfer by means of logging. The only product which supported a true file transfer facility, in terms of ASCII and BINARY file transfer with error checking and retry, was PC 2622.

Like Series 100 DSN/LINK PC 2622 comes with a sister program for file transfer which resides on the HP 3000. Walker Richter and Quinns' implementation is slightly more flexible in that the user may select where this program resides on the HP 3000 instead of requiring installation by the system manager. PC 2622 displayed a status screen with information similar to that of DSN/LINK. A display of the number of characters/records in the file and the current number transferred is updated regularly. An optional error status may be selected which maintains information concerning several types of errors which may occur in transmission including timeouts andparity errors.

CONCLUSION

Having reviewed all of the microcomputers available which have communuication capabilites beyond asynchronous terminal emulation, the systems which stand out as exceptional in their interface with the HP 3000 are those which were clearly designed with this specific capability in mind.

The HP 150 and DIRECT 1025/1625 micro-computers clearly stand out as amoung the best systems for communications with the HP 3000. Of these systems the HP 150 is unique since it emulates the HP 2623 terminal supporting HPs' graphics products on the HP 3000. One feature which sets these systems apart from the others is that the terminal emulation code is in ROM. This allows these systems to be configured to boot up as a terminal without having to load any code into memory. I am disappointed in not being able to use the HP 150s' standard 256K of RAM as display memory.

Amoung the next group I would include the HP 200 series with the HP 2623 terminal emulation program and the IBM PC running PC2622. PC2622 is an execellent disc-based terminal emulation programs with integrated file transfer utility.

The HP 120/125 and the HP 86/87 both provide adequate terminal emulation and file transfer capabilities. Block Format/125 and Series 100/DSN/LINK lack a needed user friendly integration so that re-loading of code is not required when changing functions. Block Format could be significantly enhanced by emulating an HP 2622 instead of supporting VPLUS applications only, but for many users it will perform all or most of the needed functions. The HP 86/87 screen size is a limiting factor as are the applications available on this machine.

I would not consider VDTE, which functions to a limited degree, unless VT52 emulation and/or HP 2648 graphics capabilities are also desired. PCCOM failed nearly all of my block mode terminal emulation tests and obtaining help from DWJ associates proved to be very difficult and never prompt.

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