

W S 2 6 0 (tm)

WORKSTATION EMULATOR/260

USER'S MANUAL

Version 7.10

For IBM-PC, XT, AT, PS/2, and Compatibles

A Product of

WS260, WORKSTATION EMULATOR/260
User's Manual

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I. OVERVIEW

The Hewlett-Packard HP250 and the follow-on HP260 have been very innovative small business computers. The operating system, IMAGE data base, and softkeys make it one of the easiest to use minicomputers, especially suiting it for use in turnkey applications. One of its few drawbacks, however, was its use of non-ASCII workstations which are only suited for use with an HP250/260. They cannot be used to connect to other computers, to control auto-dial modems, or as terminals on an upgrade machine such as the HP3000. Further, the options for connecting printers to the HP250 workstations have been inadequate: an obsolete HP2631 HP-IB printer can be connected to the discontinued HP2649D, and the HP2622D supports only an internal thermal printer. To date, the HP25262D supports no local printers. With Operating System B.08, Hewlett-Packard introduced the capability to use ASCII terminals, but this capability has not yet been matched to the HP260 system well enough to be acceptable. For example, the effective throughput when communicating (nominally) at 9600 baud is less than 1200 baud and synchronization of the terminals with the HP260 has been a source of problems. Also, printer operation on the HP2392A has been unreliable. The "RIO" terminals such as a PC running **WS260tm** remain the best HP250/260 terminals.

The **WS260tm** Workstation Emulator consists of software that runs on standalone personal computers (PCs). It sends properly translated characters to the HP250/260 and interprets and carries out commands from the HP250/260. The software mainly performs communications and terminal control tasks and has been designed and tested to 19,200 baud.

The HP260 Workstation Emulator provides virtually a full emulation of the HP2622D workstation. Beyond this, it provides features that have been needed in a good HP260 workstation. (References to "HP260" will include the "HP250" except where differences are explicitly called out.) Local printers can be accessed, files can be transferred to and from PC disk(ette)s, and auto-dial and security modems can be controlled. Also, a variety of display enhancements can be used, depending on the monitor being utilized, and almost any keyboard configuration can be accommodated. Finally, the emulator can read a "perform file" and operate automatically according to the keystrokes in that file. The resulting workstation is suitable for running applications as well as for software development.

The emulator requires no modification to existing HP260 hardware or software; and, the HP260 cannot detect that it is not connected to an HP2622D. A microcomputer running the emulator can do everything an HP2622D can do. It is perhaps worth emphasizing that **WS260tm** is only a workstation emulator, not an HP260 environment emulator. That is, HP260 software cannot be run on a standalone PC not connected to an HP260. HP260 software still runs on an HP260 and the PC running the emulator interacts with the software as a normal HP260 workstation would.

WS260[™] is written in "C" with keyboard and serial port interrupt handlers written in 8088/86 assembly language. The software runs on all IBM-PC/XT/AT/PS compatible MS-DOS microcomputers, including those from the following manufacturers:

IBM (PC/XT/AT/PS)
HP (Vectra)
AT&T (6300)
COLUMBIA
COMPAQ
CORDATA (CORONA)
DELL (PC's LIMITED)
EAGLE
EPSON
EVEREX
ITT
KAYPRO
LEADING EDGE
MITSUBISHI
NCR
PANASONIC
SANYO
SHARP
TANDY
TELEVIDEO
TOSHIBA
WYSE
ZENITH

WS260[™] has operated properly on every true PC-compatible unit tested. The only problem encountered was with the Hyperion portable which uses a different serial I/O chip than true clones. The keyboard programmability of **WS260[™]** permits accommodating the different keyboards found on these many machines.

WS260[™] is operational on several portable units ("luggable" and "laptop"). This opens a new dimension to use of an HP260 heretofore not available but needed.

This manual provides details on the operation of the **WS260[™]** software. It assumes that the user is already quite familiar with the HP260, its commands, and operation of the HP2622D. Familiarity with MS-DOS and the particular microcomputer being used is also assumed.

II. INSTALLATION

Installation of **WS260[™]** on the MS-DOS computer (hereinafter usually referred to as the "PC") involves the following tasks:

assuring that the PC is properly configured in terms of port adapters, memory, and operating system;

connecting the PC to an HP260, either directly or through a modem;

possibly connecting printers to the PC;

running the software from the distribution diskette or installing it on another disk.

These are discussed below. Most of the information applies generally to all MS-DOS machines. Where special considerations apply for particular machines, these are pointed out.

Required PC Configuration

WS260[™] does not require much memory relative to the memory that is typically used in an MS-DOS PC. A bare minimum is 128KB, although the emulator itself requires less than 50KB. (For the usual mix of word processing and spreadsheet applications, a minimum of 256KB of memory is normally recommended, and 640KB is common.)

The connection to the HP260 must be made through an asynchronous port on the PC configured either as "COM1:" or "COM2:". The port may be on a standard asynchronous adapter in the PC or on one of the popular multi-function cards. "COM1:" must use interrupt "4" and "COM2:" must use interrupt "3". Note that some third-party hard disks, tapes, LANs and other peripherals sometimes use these interrupts. It is usually possible to change the interrupt to some other unused one. Check the installation instructions for the peripheral if problems arise.

If a printer is to be used, it may be connected to either a serial or parallel port. If a serial printer is used, it must be connected to an asynchronous port configured as "COM2:" if the HP260 port is "COM1:", or as "COM1:" if the HP260 port is "COM2:". If a parallel printer is used, it may be connected to a parallel port configured as "LPT1:" or "LPT2:". It is also possible to have both serial and parallel printers on a system. The desired printer can be selected through the Configuration screen as described in Section III.

Either a monochromatic or color display may be used. **WS260[™]** determines which is connected to the system. All color displays are supported, including CGA, EGA, and VGA units. Composite video

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monitors are least desirable because of their limited video enhancement capabilities compared with TTL monochrome monitors and color monitors.

At least one diskette drive is required from which to load **WS260[™]**. It is available on both 5.25" diskettes and 3.50" microdiskettes.

MS-DOS 2.0 or later must be used. The ANSI screen and keyboard extensions are necessary for proper operation of the Direct ASCII mode. In order to load this, create a file named "CONFIG.SYS" which contains the line

DEVICE=ANSI.SYS

Alternatively, copy the CONFIG.SYS file provided on the distribution diskette, as explained below, but be careful not to copy over an existing file of the same name with other important system information.

WS260[™] was originally written explicitly for the IBM PC keyboard. Great care was taken to place the keys near where they are normally found on HP260 keyboards. Subsequently, with the changing "standard" IBM keyboards, a keyboard programming facility was introduced. This allows the location and functions of keys on IBM and other keyboards to be changed. Thus, Vectra, Tandy 1000, Keytronic, and a host of other keyboards can be successfully used.

Connection to the HP250/HP260

For a direct connection, the asynchronous port of the PC should be connected to one of the HP260 asynchronous ports with a "straight through" data cable. This applies if the PC port is configured as DTE (Data Terminal Equipment), which is the usual case. Some machines, however, such as the Corona and several multifunction cards permit port configuration as DCE (Data Communication Equipment), in which case a null-modem cable is required. See Appendix A for details of serial data cable connections. Although the RS232 standard limits cable length to 50 feet for 9600 baud operation, in practice, the cable can be up to about 250 feet if carefully fabricated. Beyond this, line drivers or short-haul modems may be required.

The HP260 port used must be configured as

"WORKSTATION", "SERIAL", "2622", "32KB" or "64KB" of memory.

If the older desktop HP250 is being used, the ten straps for the selected port on the back of the 5-port async panel should normally be all in the "A" position (left and center jumpered). If the newer HP250 or the HP260 is used, the dip switches for the selected port on the back of the 5-port async panel should normally be set for "direct connect". This is shown in the diagrams near the dip switches. On all models, the corresponding thumbwheel on the ASI board must be set at the rate to be used (or the HP260 software configuration must be set properly). The relationship of the numbers on the wheel to rate is as follows:

Thumbwheel Number	Rate, Baud
0	110
1	150
2	300
3	600
4	1200
5	1800
6	2400
7	4800
8	9600
9	not used

HP260 rates may be set through the "CONFIG" software.

For dial-up operation, the PC should be connected to a suitable asynchronous, full-duplex modem. Rates of 300 baud and under are not very satisfactory. Best results will be obtained with a 1200 baud unit (Vadic 3400 or Bell 212 compatible) or one of the newer high speed, full-duplex, asynchronous modems. "Accelerators" have been successfully used with **WS260tm**, permitting throughput of double or triple the rate of the modem being used.

The modem on the HP260 end must be compatible with that on the PC end. The connection from the modem to the HP260 asynchronous port must be made with a cable equivalent to HP's 45111A cable. See Appendix A. All other configuration and strap settings are the same as with the direct connection.

Connection to Printers

Printers connected to the PC should use the appropriate serial or parallel data cable for the printer in use. The parallel connection is the simplest in terms of printer strapping. A professionally fabricated cable should be used.

The serial connection presents a variety of options, depending to some degree on the printer being used. The cable to the PC will have to be fabricated or bought. See Appendix A for pin connections. The most significant aspect of using a serial printer is that hardware handshaking must be used since **WS260sm** provides no special device driver to handle DC1/DC3, ETX/ACK, ENQ/ACK, or any other character protocol. Hardware handshaking is implemented using pin 5 of the asynchronous adapter. Pin 6 must also be held logically "high". This can be jumpered to any pin in the interface that is always kept high. The emulator software checks the status of pin 6 to determine whether the serial printer is turned on. Most printers use pin 20 for hardware handshaking and must be strapped internally for an "active low" busy line. Note, however, that some printers use other pins, such as 11 (Texas Instruments and Okidata) and 19 (NEC). The printer cable shown in Appendix A should satisfy the interface requirements of most printers.

Loading The WS260tm Software

The distribution diskette contains the following files:

File Name	Contents
-----	-----
WS260.EXE	The emulator program
WSINSTAL.BAT	The installation batch file
README	Information that updates that in the manual
SAVEIT.DAT	An HP260 program for storing transmitted files
CONFIG.SYS	The DOS configuration file which loads ANSI.SYS
WS260.DTY	Dialing directory sample entries
PERFORMn.DAT	Sample perform files
WS260.KBD	The keyboard translation file that will be used if the 'TRANSLATE' option is selected in the configuration menu
TNDY1000.KBD	Tandy 1000 keyboard configuration
KYTRONIC.KBD	Keytronic KB5151 keyboard configuration
IBMENHAN.KBD	IBM Enhanced keyboard configuration
COLUMN.EXE	Program to convert columnar HP250/260 output to form for "importing" into Lotus, VF-planner, etc.
CODES.EXE	Program to display key codes for any keyboard
WS260.DOC	Manual in WordPerfect format
WS260.TXT	Manual in DOS text format

WS260tm will create a file WS260.DAT on the logged device in which is stored the current configuration. This is used to simulate the HP2622D's configuration held in battery backed-up memory. If the file is not found, WS260tm will revert to its default configuration given in Section III. below.

If it does not exist, WS260tm will also create a file WS260.DTY which contains the Dialing Directory (see Section VIII). The file of this name on the distribution diskette contains sample entries. These may be deleted or modified.

The PERFORMn.DAT files are sample perform files. They are discussed in Section IX.

If the keyboard TRANSLATE option is used, a file named KEYBOARD.CHK will be created which contains an internal form of the scan codes and their replacements.

The line "DEVICE=ANSI.SYS" should be added to your CONFIG.SYS file, or CONFIG.SYS on the WS260tm distribution diskette should be copied to your system disk. ANSI.SYS should also be on the disk. Obtain this from the DOS distribution diskette. If these files are not on the system disk used to boot the system, strange characters will appear on the screen when starting WS260tm, when entering the Direct ASCII mode, and when exiting WS260tm. This will not impair the operation of WS260tm but will give distorted displays in these three situations.

To run from the distribution diskette, place it in an available diskette drive and make that the default drive. Enter "WS260" to start the emulator. The copyright screen with the Serial Number should appear along with softkeys labeled "BEGIN WS260" and "EXIT EMULATOR". Press the first one to make the emulator operational. The configuration selections described in the next section can then be made.

WS260[™] may be installed on any type of medium, including hard disks, diskettes, tapes, Bernoulli cartridges, etc. Each WS260[™] distribution diskette allows installation of two, and only two, copies of the software. The first copy is the production version you will use, and the second copy is for backup purposes.

Installed copies of WS260[™] may be uninstalled back to the distribution diskette and installed on other media, if desired. An installation count on the distribution diskette is decremented for each install and incremented for each uninstall (up to the maximum of 2).

The procedures for installing and uninstalling are as follows:

INSTALLING WS260[™]

Place the distribution diskette (with NO write protect tab) in a drive and log to that drive. Enter

```
WSINSTAL from: to: \dir
```

where "from:" stands for the drive designator of the distribution diskette, "to:" stands for the drive designator of the destination medium, and "\dir" stands for an optional directory to be created on "to:". Notice that there is a space between "to:" and "\dir". If the directory already exists, the message "Unable to create directory" will appear, but this is innocuous. Everything else is automatic.

UNSTALLING WS260[™]

WS260[™] can be removed simply by deleting the associated files (named above). Copy protection has been removed from the product, simplifying installation and deinstallation.

If Problems are Encountered

When WS260[™] starts, a copyright/license screen appears with two softkeys, one labeled "BEGIN WS260". Pressing that key should result in a display of a copyright banner at the bottom of the screen. If the banner does appear, then there are several functions that can then be performed, even though the PC is not connected (or not correctly connected) to an HP260. These functions are the Configuration (SHIFT F1), Label (SHIFT F8), and Direct ASCII (ALT F1) functions. Also, the bottom line can be cycled through

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banner, status, and blank using SHIFT F5. A cursor will not appear unless all connections to the HP260 are correct and configurations in the PC and the HP260 are correct

If the banner does not appear, then there is a problem. This can usually be traced to an incompatible configuration (other than the necessary device=ansi.sys line) entry in CONFIG.SYS or AUTOEXEC.BAT. It is best to use only the suggested CONFIG.SYS line and no MODE commands as a starting point. Add in other desired boot-up options after **WS260tm** is operational to see which are compatible.

A common problem area is an improperly wired cable. Especially note that if a modem connection is being used, the cable between the HP260 and the modem is not a straight-through connection. This cable is unlike that between the PC and its modem. Troubleshoot from the HP260 back, using an HP2622D if one is available to confirm proper operation at each point in the link.

A problem has been reported with **WS260tm** when run on certain types of PCs which operate display modes outside the normal IBM-compatible modes: **WS260tm** can hang up and the PC must be cold booted. We believe that this problem is related to the way the display enhancement features override the normal IBM standards. **WS260tm** reads the installed equipment list using interrupt 11 (hex) and determines whether a color or monochrome display is installed. If the results of this call do not agree with what is actually being used, the emulator can hang up.

As a fix, the new version (7.10) allows including additional command line switches to prevent use of the equipment list interrupt. These switches are as follows:

<code>ws260 /co</code>	indicates that a "color" monitor is installed
<code>ws260 /mo</code>	indicates that a "monochrome" monitor is installed

A perform file may still be included on the command line, either before or after the switch, as follows:

```
ws260 perform1.dat /co
```

If **WS260tm** hangs up without the switch, experiment with using the switch options to see which one results in proper operation with your equipment.

III. CONFIGURATION

The **WS260tm** Configuration program may be run even if the workstation is not connected to an HP260. Once the emulator has been started, press **SHIFT F1** and the Configuration screen will appear as on the HP2622D. Although similar to that on the HP2622D, the **WS260tm** screen will be seen to have many additional selections relating to the printer, the Log and Send files, video enhancements, cursor control, and keyboard options.

Square brackets are used in the Configuration screen to highlight the variable fields. The cursor begins in the first variable field and can be moved to the next by pressing the **TAB** or **RETURN** key. The cursor may be moved backward by pressing **SHIFT TAB** or **SHIFT RETURN**. In all but the file name and Delay fields, the function keys are used to select the **NEXT (F2)** or **PREVIOUS (F3)** allowable choices. The **DEFAULT VALUES (F4)** key will fill the screen with the default settings shown below. The **SAVE CONFIG (F1)** key saves the configuration shown on the screen. This is saved in a file named **WS260.DAT**. **WS260tm** will continue with this configuration and will also be impressed with this configuration on subsequent starts. The **EXIT (NO SAVE)** key will leave the configuration mode without changing the configuration and any changes made on the screen will be ignored.

The variables are grouped into four areas: communications, files, video, and miscellaneous. The meanings of the variable fields in these areas are as follows, with the default values shown highlighted:

Port to HP260: **COM1: 9600** Baud **7** Data Bits **ODD** Parity **1** Stop Bit

Either **COM1:** or **COM2:** may be used on IBM-PC compatible units. This selection takes precedence over the serial printer port selection discussed below. The default rate of 9600 baud is normally used when directly connected. Lower rates such as 1200 baud are used when communicating through a modem. When connected as a Workstation, set the port for 7 Data Bits, **ODD** Parity, and 1 Stop Bit. On a newer HP260, a communications rate of 19,200 baud may be used.

Port to Printer: **LPT1:** Baud **.** Data Bits **....** Parity **.** Stop Bit

The default printer port is **LPT1:**. **LPT2:** may also be selected. The remainder of the items on the line are not used for these parallel printer selections. If the serial port **COM2:** is selected, the remaining fields on the line become active:

Port to Printer: **COM2: 1200** Baud **8** Data Bits **NONE** Parity **1** Stop Bit

Whichever serial port is not being used for the PC-to-HP260 communications may be used for a serial printer. The rate, 7 or 8 Data Bits, **NONE**, **EVEN**, or **ODD** Parity, and 1 or 2 Stop Bits may be selected. It is best to send to the printer at a rate just higher than it can actually print. When logging to the printer, the rate of the printer will pace the emulator's response to the HP260. The **MODE** command should not have been used to redirect the printers before entering **WS260tm**.

Log File: _____

This field must be filled in to have a Log File opened. A new file is created unless the named file exists, in which case it will be purged and recreated. A file is specified as "d:name.ext", where "d" is the drive letter, "name" is up to 8 characters, and "ext" is up to 3 characters. The drive designator may be omitted if the logged drive is to be used. An error message will appear if an improper file name is given.

Send File: _____ **ENTER** Terminator **0000** Delay

The Send File is similarly specified. If it does not exist, an error message will be displayed. The file must contain lines of ASCII characters. The Terminator field determines whether each transmitted line is ended with an ENTER or a NEW LINE. The significance of this will be explained in Section VII. The Delay parameter specifies an amount of time between sending successive characters from the Send File. This should normally be set to 0, but may have to be increased to accommodate heavy loads on the HP260.

Note that only one of the files, Log or Send, can be open at any one time. Also, when the Configuration routine is entered or the emulator is exited or suspended, any open files are closed. Therefore, finish any file logging and sending before performing these functions.

Next on the Configuration screen is a presentation of the video enhancements as they will appear on the display in use. Each of the sixteen enhancements consists of a 2-character hexadecimal code and the display using that code. The default codes will produce the named, normal HP260 video enhancements on a monochrome IBM monitor except for certain combinations with inverse video.

Some of the default enhancements will not be distinguishable on some monitors. For example, monitors used with a color graphics adapter (CGA) will not be able to display an underline. The display enhancement codes may be modified to accommodate this situation by selecting a displayable enhancement.

When a full color monitor is being used, it may be desirable to convert some of the enhancements to specific colors. For example, inverse could be made green, blinking could be made red, etc.

The enhancement code corresponds to the IBM attribute byte. The bits in the attribute byte are as follows, where "bg" stands for background and "fg" stands for foreground:

/blink/bg red/bg grn/bg blu/intensity/fg red/fg grn/fg blu/.

For example, an enhancement of blinking green on red with high intensity would result from a code of binary 11001010, or hexadecimal CA.

Experimenting with the enhancements will produce some interesting results. Note that when entering the codes, they must be hexadecimal digits 0 through 9, A, B, C, D, E, or F. Upper and lower case are acceptable. Blanks are treated as zeroes.

The Miscellaneous section of the Configuration screen shows

Emulator Cursor Top: **11** Bottom: **12** Exit Cursor Top: **11** Bottom: **12**
Keyboard: **IBM** Blank When Scrolling: **Y** Special Print Chars: **Y**

The cursor numbers are the top and bottom scan lines for the cursor while in the emulator and for setting the cursor on exit to MS-DOS. Some computers, such as the COMPAQ which have displays that appear to the operating system as color/graphic displays but which also display high resolution text might display a cursor in the middle of a line rather than on the bottom. Adjusting the top and bottom scan lines permits positioning the cursor as desired. It is also possible to define a split cursor by making the bottom line less than the top line.

The Keyboard type is either IBM or TRANSLATE. Use of the TRANSLATE option causes the key replacements defined in the file WS260.KBD to be used in place of the standard IBM-PC keyboard. See Section IV.

The Blank When Scrolling field is either Y or N. The default Yes should be used with the IBM color graphics adapter (CGA) or whenever the "snow" on the screen is objectionable. This setting causes the video display to be turned off before scrolling and back on after scrolling, causing a noticeable "blink" to the display. Set this option to No for other adapters and displays which do not produce snow during scrolling.

The Special Print Chars field is either Y or N. When set to the default Yes, characters sent to the printer attached to the PC are from the full IBM-compatible character set. This includes graphics and special characters. Printers that are compatible with this set will display them correctly. For other printers, set this field to No. In that case, all characters with ASCII values larger than 127 are set to a period (".").

IV. GENERAL OPERATION, KEYBOARDS, AND DISPLAYS

With knowledge of the HP260 and its normal workstations, a user should have very little difficulty learning to operate **WS260tm** from a PC. The different key placement on the keyboard may present some initial problems, but these will soon be overcome with use.

Screen displays are pretty much identical to the corresponding HP2622D displays. A 25th line shows status of several variables including the softkey **CYCLE**, whether logging to a printer and/or PC file is in progress, the name of the Log File, whether information is being sent from a PC file, the name of the Send File, whether a combined number/cursor pad will transmit **NUMBER** or **CURSOR** information, whether **CAPS** lock is on or off, and whether the **INSERT** mode is on or off. **SHIFT F5** rotates the 25th line from the copyright notice, to the status line, and to a blank line. The status line is forced on when certain features such as file use are activated. Some error messages temporarily appear in this status line area.

The Keyboard

The keyboard layout goal was to use normal PC keyboard labels where reasonable. There is, thus, a one-to-one mapping of most keys and key combinations. The table on the following page shows the original/standard correspondence between the HP2622D and the PC keyboards and functions. More details are shown in Appendix D.

HP2622D KEY

Alphanumeric characters

SFK1 - SFK8

RESUME

CYCLE

EXECUTE

BACKSPACE

TAB (forward)

SHIFT TAB (backward)

TAB+ (set)

TAB- (reset)

CAPS LOCK

CLEAR

NEW LINE

HOME

UP ARROW

DOWN ARROW

LEFT ARROW

RIGHT ARROW

DELETE

INSERT

ENTER

ENTER (pad)

HALT

CTRL

SHIFT

IBM-COMPATIBLE KEY

one-to-one correspondence

F1 - F8

F9

F10

ESC

BACKSPACE

TAB

SHIFT TAB

ALT TAB

ALT SHIFT TAB

CAPS LOCK

PRTSC: *

END (CURSOR mode)

HOME (CURSOR mode)

UP ARROW (CURSOR mode)

DOWN ARROW (CURSOR mode)

LEFT ARROW (CURSOR mode)

RIGHT ARROW (CURSOR mode)

DEL (CURSOR mode)

INS (CURSOR mode)

RETURN

+ (to the right of the

pad; not affected by

CURSOR status)

SCROLL LOCK/BREAK

CTRL

SHIFT

All shifted function keys on the HP2622D operate identically under **WS260tm**. There are additional functions, however, as denoted by asterisks below:

FUNCTION KEY COMBINATION	EFFECT
-----SHIFT	-----
F1	Configuration screen
SHIFT F2	* Exit WS260tm
SHIFT F3	* Close SEND or LOG file
SHIFT F4	Print screen
SHIFT F5	Toggle status line
SHIFT F6	* Cycle log type
SHIFT F7	* Toggle sending from SEND file
SHIFT F8	Label definition screen
ALT F1	* Direct ASCII mode
ALT F2	* Exit-to-Shell
ALT F3	* Toggle ACKing
ALT F9	* Drop RTS and DTR temporarily to disconnect modem
ALT F10	* Escape to "hot-key" mode

CTRL and SHIFT CTRL function keys for changing video enhancements operate as on the HP2622D.

All SHIFT, CTRL, CAPS LOCK combinations on the HP2622D are the same on the PC keyboard. The PGUP and PGDN keys on the keypad are equivalent to SHIFT UP ARROW and SHIFT DOWN ARROW. Either may be used. The NUMLOCK key on the PC keyboard toggles between a NUMBER and CURSOR control pad. Note that the INS and DEL are only functional in the CURSOR mode. The current mode is shown on the status line (SHIFT F5). The "+" key on the PC keypad is identified with the HP2622D keypad ENTER key. (The number pad ENTER key with CTRL may be used to single step through HP260 programs in the mode where subprograms, loops, functions, etc. are executed entirely before returning to the next main program line.)

As shown above, the PC ALT (ALTERNATE) key is used for several functions. One is setting (ALT TAB) and clearing tabs (ALT SHIFT TAB). Another is ALT F1 which invokes the Direct ASCII mode. ALT F3 toggles the ACKING between the PC and HP260. It is used to freeze and release a screen during transmission from the HP260. (Its use is similar to CTRL S and CTRL Q to send X-on and X-off characters on standard ASCII terminals.) Another use of the ALT is ALT F2 to Exit-to-Shell. ALT F9 drops RTS and DTR on the port connected to the HP260. Finally, ALT F10 escapes to permit entering "hot-keys" defined to invoke memory-resident programs. Enter F10 to re-enable the emulator. All of these are shown in the labels (help) screen which can be brought up at any time with SHIFT F8.

The Exit-to-Shell capability permits keeping **WS260™** loaded in memory after it is exited. By pressing ALT F2, you can exit, perform DOS functions, and run DOS programs (for file manipulation, word processing, spreadsheets, etc.). Then, by entering "EXIT", you will jump immediately back into **WS260™**. Several things should be noted. First, the COMMAND.COM file must be accessible in a path from the directory from which **WS260™** is run. Next, understand that when each shell is invoked, **WS260™** and DOS remain running in about 110KB of memory that cannot be accessed. Thus, applications would not have access to as much memory as they normally would, and such applications as spreadsheets might run out of memory.

When **WS260™** is suspended (ALT F2), the communications port is now kept active. It will continue responding to HP250/260 commands and keep the job running while you continue to use your PC for other functions. Note, however, that file transfer will not continue to run.

Note that if you want to maintain a modem connection when suspended or fully exited, no functions should be performed from the shell that interfere with the communications port being used.

An interesting possibility with the shell is to start a second copy of **WS260™** using another communications port to another HP260. Even better is to run **WS260™** under a multitasking environment such as DESQView. In that case, printer functions can proceed while **WS260™** is running in the background.

While the Exit-to-Shell is triggered through ALT F2, a normal exit is made with SHIFT F2.

There are some keys on the PC keyboard that have no equivalents on the HP2622D keyboard. When these keys are pressed, a null is transmitted to the HP260, causing a BEEP response. These keys are for the characters logical-or ("|"), backslash ("\"), open brace ("{"), close brace ("}"), and tilde ("~").

The PC key for "open brace"/"open bracket" will always transmit "[", regardless of the shift status. Likewise, "close brace"/"close bracket" will always transmit "]".

The Key Label screen, obtained by pressing SHIFT F8, shows ALTERNATE, SHIFT, and CTRL function key functions as well as the currently defined softkey labels. Note that in this section, the enhancements for softkey labels are all overridden, and the labels appear with the enhancement defined as "unenhanced". The status line is forced on for this display. Exit the display by pressing the space bar.

Keyboard Programming

The keyboard for **WS260tm** was originally set up only for the IBM-PC keyboard. Any keyboard can now be accommodated, or functions on IBM keyboards can be relocated. Here are some instructions on how to implement the new keyboard translation feature.

First, **WS260tm** will run as usual unless 1) you create a file called "WS260.KBD" in the same directory as "WS260.EXE", AND 2) the keyboard option on the configuration screen is changed from "IBM" to "TRANSLATE". The file WS260.KBD is a normal MS-DOS data file created with a text editor or a word processor (and saved as an ASCII file). It contains an arbitrary number of pairs of keyboard codes, the first of each pair showing which code is to be replaced and the second showing the corresponding PC code that is to be substituted in its place. The PC codes used to implement HP250/260 functions are shown in Appendix D.

The scan code is simply the manufacturer-assigned physical number of the key on the keyboard and is what the BIOS uses (along with the shift status) to come up with ASCII codes. The shift status simply specifies which of the five possible shift states are on and off (Shift, Control, Alternate, NumLock, and CapsLock). An example helps show how these must be specified in WS260.KBD. Suppose on a normal PC keyboard we want to make the cursor/number pad minus ("-") into the HP250/260 CLEAR key. Suppose also that we want to make the */PrtSc key (normally used as the CLEAR key in **WS260tm**) perform the functions printed on the key. The code pairs to accomplish this would be

74	*	55	-
55	U	9	S
55	S	62	S
55	CS	0	-
62	S	0	-

In the first line, the "74" says that the minus key near the pad is to be replaced with key "55", the */PrtSc key. The asterisk ("*") says that all possible shift conditions are to be considered and the "-" after the replacement scan code indicates that the original shift conditions are to be carried through during the replacement. The second through fourth lines redirect the functions of the */PrtSc key; the second line

saying the unshifted key is replaced with key 9 shifted (which gives an asterisk); the third line says that the shifted */PrtSc key is replaced with key 62 (F4) shifted which performs the "print screen function"; and the fourth line says the control shifted */PrtSc is to be disabled. Finally, key 62 shifted which normally performed the print screen function is also to be disabled.

The scan codes are relatively simple. The shift conditions are a little more complicated. If S (Shift), C (Control), A (Alternate), N(Numlock) or their combinations are specified, the key intercepted must match exactly in scan code and shift status, except that in all cases the CapsLock key is carried through and not included in the tests. An unshifted key is given by any other character but "*", such as "-" or "U". The asterisk is reserved to indicate that all possible shift status combinations are to be considered. If the replacement shift status is given, then that is used in the replacement. If a "-" is given, then the original shift status is used. It is important that all four elements or their place holders appear on each line. In order, they are 1) scan code of key to be replaced, 2) shift status to be considered, 3) scan code of replacement key, 4) shift status of replacement, if applicable.

In case you don't have the scan codes for your keyboard, we have included a small utility called "CODES.EXE" which can be run to find the scan codes and shift status of any keys on your keyboard. Simply enter "CODES" and follow the instructions.

We have included and shall be distributing more pre-defined translation files for various PCs. These have the extension ".KBD" and define keyboard function changes or relocations on various non-IBM PC keyboards. Most have been contributed by users. They are provided for your use without any guarantee of their accuracy.

In order to implement any keyboard, perform the following steps:

1. COPY the desired .KBD file to WS260.KBD
2. Set the Keyboard option in the Configuration Screen to TRANSLATE
3. Possibly, modify or insert additional keyboard replacement codes for your own requirements according to the above instructions.

Keytronic KB5151 Keyboard:

The Keytronic KB5151 keyboard initializes with NumLock and CursrPad off (LEDs unlit). In order to engage the separate cursor pad, first press NumLock and then press CursrPad. The right hand pad then will function as the number pad, and the one to its left will give the cursor functions. It is common for the CursrPad and NumLock keys to get "out of sync" on the KB5151. In order to resynchronize them, press the CTRL or RESET key along with the CursrPad or NumLock key to change its state as described in the KB5151 instructions.

Because the cursor pad key codes from the KB5151 are accompanied by a SHIFT code, the HP250/260 shifted cursor keys are not recognized properly. Therefore, if using the separate cursor pad, press ALT and the cursor key for the shifted function. For example, for the HP250/260 SHIFT HOME function, press ALT HOME.

IBM Enhanced Keyboard:

The IBM Enhanced keyboard is used on newer XTs, ATs, and the PS/2 machines. It is similar to the Keytronic keyboard in that it contains separate number and cursor pads. The file IBMENHAN.KBD contains several changes from the standard PC keyboard. These include 1) use of the PrintScreen key for that function; 2) use of the "*" above the number pad as an asterisk; 3) identification of F11 as the CLEAR key and F12 with the SHIFT CLEAR function (clear-from-cursor-to-end); 4) use of the "+" key near the number pad as a plus; 5) implementation of the separate number and cursor pads; and use of ALT and cursor keys to implement the usual SHIFT and cursor keys.

A few things to note operationally are the following. If the cursor pad keys do not behave correctly, press CTRL-NUM LOCK to get them back in sync. The F11 (CLEAR) key can be used with the usual SHIFT, CTRL, and CTRL-SHIFT keys to effect clear-from-cursor-to-end, clear-from-cursor-to-end-of-line, and clear-full-display, respectively. Similarly, F12 can be used with the CTRL key to cause a full display clear.

Such combinations as SHIFT HOME and SHIFT INSERT are replaced on the enhanced keyboard with ALT and the appropriate cursor pad key. This was necessary because SHIFT interacts with the keys to produce characters on the number pad.

When using a keyboard with separate number and cursor pads, use this keyboard translation file when in doubt.

Most of the special characters for keyboards other than the USASCII keyboard are implemented in WS260[™]. These can be seen by running the HP Utility "TEST", selecting "DISPLAY TEST", and then "DISPLAY CHECK". The final screen that is displayed will show a line titled "OPTIONAL EUROPEAN CHARACTER SET" which shows the characters available. When other "main" or "auxiliary" keyboards are selected in the HP260 "CONFIG" program, the appropriate characters will appear on the screen. (The Katakana characters are not implemented.) For example, if the Spanish keyboard is selected as the main keyboard, pressing the IBM-PC ASCII keyboard character ";" or ":" (or the corresponding key on the Spanish keyboard) will produce the character "ñ" or "Ñ" with the tilde above it. Pressing "[" followed by "a", "e", "i", "o", or "u" will display the character with an accent mark. Special characters such as the inverted "!" and "?" are activated with the appropriate keys. Note when the selected non-USASCII keyboard is the "auxiliary" keyboard, it must be activated with a CTRL-F1 sequence or deactivated with a CTRL-SHIFT-F1 sequence.

When WS260[™] is dormant for more than about 30 seconds (i.e. no keys have been pressed and no information has been received from the HP260 within this time), it will send an ACK to the HP260, indicating that it is waiting and able to continue communication. This is similar to the HP2622D operation.

V. DIFFERENCES FROM THE HP2622D

There are inevitably differences in an emulator and the object being emulated. Although the fidelity of **WS260tm** is very high, there are some differences that should be pointed out.

First, the screen enhancements available on the HP260 and those possible on the IBM-PC compatible screens are shown in the following table. The abbreviations are IV=InVerse, BL=BLinking, UL=UnderLine, HB=Half Bright.

HP260 ENHANCEMENT -----	PC MONOCHROME -----	PC COLOR -----
IV	IV	IV
BL	BL	BL
BL/IV	BL/IV	BL/IV
UL	UL	Blue
UL/IV	UL/IV	Blue/IV
UL/BL	UL/BL	Blue/BL
UL/BL/IV	UL/BL	Blue/BL/IV
HB	HB	HB
HB/IV	HB/IV	HB/IV
HB/BL	HB/BL	HB/BL
HB/BL/IV	HB/BL/IV	HB/BL/IV
HB/UL	HB/UL	HB/Blue
HB/UL/IV	HB/UL/IV	HB/Blue/IV
HB/UL/BL	HB/UL/BL	HB/Blue/BL
HB/UL/BL/IV	HB/UL/BL	HB/Blue/BL/IV

The difference between some of the half and full bright display combinations is less perceptible than on the HP260. The relative brightness control on the monitor can be used to accentuate the difference.

The IBM-PC display has two intensities, normal and bright. The HP2622D has a normal intensity and half bright. That is, the enhancement on the PC goes up from normal, while on the HP2622D it goes down from normal. When **WS260tm** is running, the high intensity is used, and half bright uses the lower or normal intensity. Consequently, it may be necessary to adjust the brightness and relative brightness controls on the PC display to comfortable values upon entering and leaving **WS260tm**.

The standard IBM-compatible graphics characters are used to represent the HP260 line drawing characters. The IBM-compatible PC's graphics characters are less extensive. Reasonable identifications have been made with the HP260 set. The resulting forms will be recognizable, but not identical to their HP2622D appearance.

Control characters that are produced when Display Characters (CTRL F4) is on and when certain control keys are pressed are different from those of the HP260 character set. The correspondence for these is shown in Appendix B.

The CAPS LOCK key on the HP2622D is a mechanical lock that always "remembers" whether it is locked. The CAPS LOCK key on the PC is a software toggle only and, as such, has no memory over program loads (when the interrupt handlers are changed) and resets. Consequently, it might be noticed that the CAPS LOCK status may change when exiting and re-entering **WS260^{em}**, after resets (CTRL HALT, SCRATCH A, etc.), and when going between background and foreground tasks. Changes in later versions now minimize this.

The NUM LOCK key, used to toggle between CURSOR and NUMBER pad modes, is a software toggle like the CAPS LOCK key and is likewise reset. (On some IBM-PC compatible units with LED indicators on these keys, the synchronization between the function and the indicator may be reestablished by pressing the key along with the CTRL key. On most keyboards, however, when **WS260^{em}** is started, it invokes its own keyboard interrupt handler that bypasses the keyboard indicator lights. They will normally stay lit or unlit, although the functions will toggle as expected. Use the status line to see how they are set.)

For both the NUM LOCK and CAPS LOCK keys, **WS260^{em}** reads the startup settings and initializes them to the corresponding values. When a CTRL HALT is performed, no changes are made to these settings.

When data communication errors occur with the HP2522D, the screen is cleared and a message is displayed. A key must be pressed to resume operation. Such errors occur infrequently when directly connected to an HP260; however, when using modems, it is not unlikely to get a poor or noisy telephone circuit. When the screen is cleared and must be rewritten for frequent errors, it is very distracting and time-consuming, especially at 1200 baud or less. The approach taken with the **WS260^{em}** emulator is to let the error through and to display whatever the improper character represents. The asynchronous port is cleared of error conditions and a blinking message is displayed on the bottom line of the screen. The message remains for a few seconds and is then cleared. The screen is not rewritten, thus allowing communications to continue. Experience has shown this to be a better approach. Also, if poor line conditions are encountered frequently, it is worth considering error correcting modems.

It is interesting to note that several types of jobs cannot be run from the VIO monitor, the HP25262D. These primarily involve the NET/260 functions NETCONNECT and NTCOPY. **WS260^{em}** running on a PC can perform all HP260 functions, and it is thus again preferred in many situations over the standard Hewlett-Packard offering.

VI. LOGGING TO PRINTER AND DISK FILES

All logging functions are accessed via the HP260 PRINTER IS 10 commands. These include

PRINTER IS 10
SYSTEM PRINTER IS 10
PRINT ALL IS 10.

In HP260 utility programs such as QUERY, simply use "10" as the printer number.

Data from the HP260 may be printed out on the printer, sent to a PC disk file, or sent to both simultaneously. Printer logging may be toggled on by pressing SHIFT F6. A "P" will appear on the status line after "LOG:". Logging may be stopped by pressing SHIFT F6 again. Be sure and set the PRINTER 10 back to 8 (or some other device) after logging is complete. Use of PRINT ALL IS 10 is convenient for monitoring data that is being logged or printed, although it will slow transmission.

In order to log to a file, it is first necessary to define a Log File in the Configuration mode. This file's name will appear in the status line after "LOG:", and pressing SHIFT F6 will then cycle between the following:

" / " (no logging),
"P/ " (logging to printer only),
" /F" (logging to file only), and
"P/F" (logging to both printer and file).

Pressing SHIFT F3 will close the Log File. The file will also be closed if the Configuration routine is invoked (SHIFT F1) or if the emulator is exited (SHIFT F2 or ALT F2).

Remember, the PRINTER IS 10 commands must be used to direct output to the local printer or the Log File. It is not sufficient to toggle the printer on or set up a Log File. Also note that if logging to the printer or disk is not selected, the HP260 will return an ERROR 133 if asked to print to unit "10". If a printer is not connected, a message will appear in the status line area, and logging will be adjusted so that the printer will not be accessed. Press any key to continue. It may be necessary to turn logging back on.

Never remove a diskette to which a file has been logged until the file has been closed. As mentioned, a file can be closed by any one of three actions: pressing SHIFT F3, entering the Configuration mode (SHIFT F1), or exiting the emulator (SHIFT F2 or ALT F2). Closing a file is necessary to flush the final buffer and to cause the directory to be updated.

When SHIFT F4 is pressed, whatever information is on the screen will be sent to the configured serial or parallel printer. Log to printer (LOG:P/) will be set temporarily and an error message will be displayed if the printer is not on. The original log state is restored after the screen copy is sent to the printer. Note that the line drawing and special characters are replaced by a period in information sent to a local printer. This screen print will not print to a Log File, only a local printer.

When logging to a disk file, **WS260tm** checks continuously to see if there is sufficient disk space to write out each line on the disk. If the available disk space becomes less than 2 sectors (1024 characters), the current log file is closed and the following message appears:

INSERT NEXT DISK. Press any key to continue.

After a new disk(ette) has been inserted, press any key and a file of the same name as the original Log File will be created on the new disk(ette). If the file already exists, the above message will reappear, and a new disk(ette) must be inserted to proceed. That is, when the message appears, it is not possible to proceed without inserting a new disk(ette) that does not have a file of the same name. If the Log File is on a fixed disk, make sure that there is enough room on the disk before beginning logging to it. Otherwise, the system will have to be rebooted when the message requesting another disk appears.

When logging causes multiple files to be created, the files are always broken after a "line feed" character. This prevents splitting lines apart.

During logging and all associated printer and disk(ette) activities, **WS260tm** paces the HP260 information according to the speed of these activities. If the printer prints more slowly than the HP260-to-PC communication rate, if the printer runs out of paper or ribbon, or if a new disk(ette) must be inserted, **WS260tm** signals the HP260 appropriately to wait to prevent data loss.

Note that when operating in a background task on the HP260, it is possible to use all printers except printer "10". Thus, it is not possible to log to a disk file or print to a local PC printer from a background task. This is a function of the HP260 and not a limitation of **WS260tm** per se. One way around this is to print to an HP260 spool file from the background task and then later to copy this to the PC (file or printer) from a foreground task.

Similarly, it is not possible to print to a local (printer "10") printer from a foreground task and simultaneously attach a background task (such as through a softkey interrupt).

Note that **WS260tm** passes through all escape sequences and special characters received from the HP260 intended for PRINTER 10. Be sure and match such sequences and characters to the printer type you have connected to the PC. For example, if HP printer control sequences are sent to an Okidata printer, unpredictable results such as loss of data can occur.

VII. SENDING DISK FILES

WS260™ has the capability to transfer data files between the PC and the HP260. This transfer uses uncorrected asynchronous communications, which is the case with all HP260 workstation communications. This is not a block mode method and has no checking or correcting of errors. Thus, the sending of long, critical files is not recommended.

In order to send a file from the PC, an existing file must be defined in the Configuration mode (SHIFT F1). The name of the Send File will appear in the status line after "SEND:". By pressing SHIFT F7, sending from the file can be toggled ON and OFF. When the end-of-file is encountered, the file will be closed automatically and the name will disappear from the status line.

How each line sent from the PC is terminated is important. If terminated with a NEW LINE, the information will simply be placed in the workstation partition's display memory (in the HP260) and not syntax checked. (Note that if the capacity of the display memory is exceeded, data will be scrolled off the top.) The displayed lines can then be read and stored; or, if they are program lines, they may be entered individually.

If each line is terminated with an ENTER, the HP260 will take an action on each line. If no program is running to read the lines, each line will be assumed to be a program line and will be syntax checked. The SAVEIT.DAT file on the distribution diskette, for example, might be transferred with an ENTER terminator in order to enter it directly as a program. It can then be STOREd.

If SAVEIT is run in the HP260, it will read each line from the screen as it is sent, halt further transmission from the emulator, store the line on an HP260 disk, reenable transmission from the emulator, and await the next line. The data in the disk file may then be later edited or used directly.

Since seven data bits are used in communicating between the HP260 and its workstations, characters which are above ASCII 127 (delete) will lose their eighth bit. This will be seen when a program is transferred from the PC to the HP260 and the program contains lines with screen control characters. These can be reentered after the transfer, or the CHR\$(n) notation can be used to avoid the problem.

The HP260 cannot accept lines greater than 160 characters (two lines) in length from the screen. Since all data from the workstation are entered through the screen and not directly to a file, this presents a limitation to PC-to-HP260 file transfer. If longer records need to be transferred, they can be broken up on the PC end, sent to the HP260, and then rejoined on the HP260.

VIII. DIRECT ASCII MODE

One of the frustrations of the standard HP260 workstation is that it does not send out normally coded ASCII characters. For example, when the sequence "CAT" is entered on the keyboard, the result sent out is "PH5". Even before this can be sent, certain modes must be set in the workstation by the HP260 and the workstation must respond properly to commands by the HP260. Thus, it is not possible to communicate with a non-HP260 host computer or an auto-dial modem connected to an HP2622D or HP2649D. The HP25262D cannot even be connected to a modem.

Consequently, a Direct ASCII mode has been included in **WS260tm**. When in the Direct ASCII mode, the special keyboard routine and key interpretations are bypassed. The normal PC BIOS keyboard routine is used, and the characters are sent out as they are entered on the keyboard. (Note that the CTRL ALT DEL combination is trapped in this mode and will terminate the emulator. CTRL BREAK and CTRL C are not trapped.)

Function key F7 will put the communications program in a half-duplex, or local echo mode for use with modems or host computers which do not echo back the characters sent to them. Function key F8 changes to full-duplex mode, the default mode. Function key F5 or F6 will clear the screen, and F1 will terminate the Direct ASCII mode, automatically issuing a RESUME to restore the pre-existing display. F3 will bring up the dialing directory, discussed below. Finally, F9 will drop DTR and RTS (similar to ALT-F9 in the emulation mode) and cause a modem to hang up.

When in the Direct ASCII mode, the screen will respond to ANSI control sequences (see the DOS manual) if the DEVICE=ANSI.SYS specification has been included in the CONFIG.SYS file. If not, parts of various escape sequences will appear on the screen and screen behavior will be erratic. Correct characters will be sent out, however.

In the Direct ASCII mode, the display acts as a "glass teletype": when lines are scrolled off the top, they are lost; cursor keys do not normally affect the display; etc. This mode could be used to communicate with a time-sharing computer; however, this is not its intended purpose.

It is not recommended that the Direct ASCII mode be used to send characters to an HP260. Returning to the emulator mode (F1) will usually clear any problems that might occur from sending inappropriate characters in the Direct ASCII mode. If not, try alternately pressing RESUME (F9) and HALT.

Dialing Directory

The Dialing Directory contains up to 10 frequently called numbers and associated modem commands along with their identifications. When in the Direct ASCII mode, pressing F3 calls up the Dialing Directory. As the menu indicates, entries may be added or modified by pressing F3 followed by the desired entry index number (0 through 9) and a carriage return. F4 followed by an index number and a

carriage return will delete the corresponding entry. Entering the index number alone will present the stored command to the serial port and thus to any attached modem.

The modem commands have been checked out for compatibility with "Hayes" and "Vadic" instruction set types. There is only one special character used in dialing commands that does not produce the character itself. That is the character "C" which sends a carriage return and pauses briefly for possible response from the modem. Control characters are simply entered as such using the character in combination with the "CTRL" key.

Note that a carriage return is always issued at the end of a command sequence and it is thus not necessary to put "C" at the end of commands. Typical dialing commands would be as follows:

for Hayes ATDT1234567

for Vadic ^ECDC1234567

Version 6.21 and later includes the capability to send out a NUL (CTRL-@) from the Direct ASCII mode. It was found that the Bay Tech Port contention switch uses this character to initiate its configuration routine.

Several function keys have been redefined in the Direct ASCII mode, as follows:

F1 - return to emulation mode
F2 - not used
F3 - display dialing directory
F4 - not used
F5 - clear screen
F6 - clear screen
F7 - half duplex mode
F8 - full duplex mode
F9 - drop DTR and RTS (hang up modem)
F10- not used

IX. PERFORM FILES

WS260tm provides the very useful capability of playing back pre-recorded commands automatically. This provides for unattended operation, performing standard tasks with a fixed sequence, transferring files during off-hours, running "canned" demonstrations, and so forth. Use of this feature will suggest many other possibilities.

WS260tm is started in the Perform mode simply by entering the name of a perform file after **WS260tm** on the command line:

WS260 PERFORM FILE_NAME

If the file cannot be found, **WS260tm** will display a message and terminate immediately. Otherwise, the file will be read, and actions will be taken according to the contents of the file.

The perform file can have any valid MS-DOS name and can be created with a word processor or text editor. If created with a word processor, it should be saved as a DOS file (with CR-LF line terminators) rather than as a word processor file.

The entries in the perform file are of two types, either single characters or function key commands. The printable, alphanumeric characters are entered as the characters themselves, and the function keys are entered as keywords within braces, sometimes with additional parameters. The keywords may be upper or lower case; however, the case may be important for other entries, depending on the state of the HP260.

Whether keys are entered directly or from the perform file, they have the same restrictions. Consequently, there are many opportunities for a perform file function to fail to achieve the desired results. Special care must be taken to be sure the correct key sequences are used, the correct case is used, the proper shift keys are specified, the correct HP260 state is used (such as SPACE DEPENDENT), and so forth. Timing is also important. The **WS260tm** perform driver will not send alphanumeric characters to the HP260 unless the cursor is on. It will, however, send function keys. For example, when an HP260 application is waiting for a softkey to be selected, the cursor is normally off, and the softkey can still be accepted. The ability to control related timing is available in the keywords discussed below.

Another matter to consider is that the HP260 may not always be in a known state. A CONTROL-HALT sequence would normally be put at the top of the perform file to set up a known condition, but this has to be used carefully to avoid corrupting databases.

As with the HP260 PERFORM capability, you must also be careful in assuming the location of function keys in programs being run. Some utilities (such as INIT, DUPL, etc.) will put disks on different softkeys, depending on the sequence in which the HP260 and its disks were turned on.

Perform File Keywords

A function key is entered as a keyword in braces, as follows:

{ENTER}

There are no spaces. This command is equivalent to pressing the ENTER key.

The perform file is made up of lines of characters and keyword commands. The end-of-line locations in the perform file are not significant (except in the Configuration mode). {ENTER} or {NEWLINE} are necessary, respectively, to signal the HP260 to accept the entry or to move the cursor to the next line. Thus, items in the perform file may be separated on lines for convenience, or kept all together.

The permissible keywords, their effect, and the allowed syntax are described in the following. Where the keyword is the same as the HP260 function key name, no further comment is made. The effect is whatever pressing that key would be.

{EXECUTE}

{BACKSPACE}

{TAB}

This may be used with {SHIFT} and {ALTERNATE} keys to perform the backtab and the tab set/clear functions.

{ENTER}

Don't forget to terminate normal HP260 commands with this.

{CONTROL}

Only effective for the next non-shift character, then automatically reset.

{SHIFT}

Only effective for the next non-shift character, then automatically reset.

{CLEAR}

{ALTERNATE}

This is really a PC key used by **WS260tm** to implement several HP260 functions. Like {CONTROL} and {SHIFT}, this is a temporary shift key that is reset after the next non-shift character.

{CAPSLOCK}

This is a toggle, changing the current state until the next appearance of this command. After a CONTROL-HALT, **WS260tm** initializes to CAPSLOCK ON.

{F1}

These are the function/softkeys.

{F2}

{F3}

{F4}

{F5}

{F6}

{F7}

{F8}

{F9} equivalent to {RESUME}

{F10} equivalent to {CYCLE}

{RESUME}

{CYCLE}

{NUMLOCK} This toggles the PC pad between numbers and cursor control. It normally would not be necessary in a perform file.

{HALT}

{HOME}

{UP}

{PGUP} equivalent to {SHIFT}{UP}

{LEFT}

{RIGHT}

{PADENTER} This is the number pad ENTER key and normally would not be used in a perform file.

{NEWLINE}

{DOWN}

{PGDN} equivalent to {SHIFT}{DOWN}

{INSERT}

{DELETE}

{STAY}

If this command appears anywhere in the perform file, **WS260™** will remain running when the end of the file is encountered. Otherwise, **WS260™** automatically exits to DOS.

{START YYYY/MM/DD HH:MM}

When this command is encountered in the perform file, **WS260™** will wait until the date and time entered before proceeding further. It can be used to wait until some set time to perform some function.

If the year (YYYY), month (MM), and day (DD) are set to zeroes, only the hour (HH) and minute (MM) will be checked. This permits use of the same perform file on a daily basis. The time is on a 24-hour military clock; and, of course, the PC clock must be properly set for this function to work.

A banner appears at the bottom of the screen showing the current date and time along with the trigger date and time. It also indicates that pressing any key will release **WS260™** from its wait state and continue processing the perform file

The format shown above must be used. A single space must follow **START**. The date must be a 4-digit year, followed by a slash ("/"), followed by a 2-digit month, followed by a slash, followed by a 2-digit day. A single space then separates the date and time. The time field is a 2-digit hour followed by a colon (":"), followed by a 2-digit minute. The terminating brace ("}") follows the time field with no intervening spaces.

{DELAY SSS}

This command causes **WS260™** to delay for approximately the specified number of seconds (SSS). For example, the command **{DELAY 5}** would cause a 5-second delay.

The seconds parameter is separated by a single space from the keyword **DELAY** and may contain 1, 2, or 3 numerical digits. The terminating brace follows immediately with no intervening spaces.

{LOG filename}

This simple command can (and should) be used in place of entering the Configuration mode, moving to the proper field, entering the LOG file name, and saving the configuration.

{SEND filename}

This simple command can (and should) likewise be used in place of entering the Configuration mode, moving to the proper field, entering

the SAVE file name, and saving the configuration. The {SHIFT}{F7} function is not necessary (i.e., should not be used) following this command since the command automatically starts sending the file.

The perform capability does not carry over to the Direct-ASCII mode. Therefore, the {ALTERNATE}{F1} sequence should not appear in a perform file. It can be used in the Configuration mode; but with limited command recognition. In this mode, only the {F1} and {F8} keywords are acted upon. You would normally only enter this mode to set up SEND or LOG files. Move to the next field by entering a blank line in the perform file, or multiple blank lines to move several fields forward. {ENTER} is not necessary in the Configuration mode. Since it is possible to make errors in moving through the entry screen, two special commands {LOG ...} and {SEND ...} have been provided. These obviate the need for going into the Configuration mode. These commands are described above.

The files PERFORM1.DAT, PERFORM2.DAT, etc. on the distribution diskette contain procedures for performing various functions and illustrate the use of perform files. PERFORM1.DAT will log to a PC disk an HP260 CAT of all files starting with "QR" on the default drive. PERFORM2.DAT will send the SAVEIT.DAT file over to an HP260 disk. Review and run these files before trying to create your own. Before using them, first use **WS260sm** to stop any application that might be running in your workstation's partition and leave a cursor on a blank line. Then exit **WS260sm** and enter the following command:

ws260 perform(n).cat

where the desired file number is put in place of "(n)". You will notice some delays as the commands in the file are processed. Before beginning processing of the first command, about a 10 second delay is built-in to allow the screen to be completely written. In addition, after most commands, a delay is built in to allow completion of the command. Other delays are explicitly included in the perform file commands.

Finally, it is stressed that a perform file should be checked since there are many opportunities for errors.

A P P E N D I C E S

- A. Serial Inter-Connection Data Cables**
- B. Control Characters**
- C. Measured HP260 Workstation Data Rates**
- D. IBM-PC Keyboard Scan Code and Shift Combinations Used to Implement HP250/260 Functions in WS260(tm)**

APPENDIX A -- SERIAL INTER-CONNECTION DATA CABLES

PC-TO-HP260 OR MODEM CABLE

PIN NUMBER OF CONNECTOR TO PC (female, DB25S, for IBM- PC)		PIN NUMBER OF CONNECTOR TO HP260 OR MODEM (male, DB25P)	
shield	1	wire shield not connected this enc.	
TD	2	2	TD
RD	3	3	RD
RTS	4	4	RTS
CTS	5	5	CTS
DSR	6	6	DSR
SG	7	7	SG
DCD	8	8	DCD
DTR	20	20	DTR

AT-TO-HP260 OR MODEM CABLE
(includes AT compatibles)

<u>PIN NUMBER OF CONNECTOR TO AT (female, DB9S)</u>	<u>TO AT</u>	<u>PIN NUMBER OF CONNECTOR TO HP260 OR MODEM (male, DB25P)</u>	
DCD	1	8	DCD
RD	2	3	RD
TD	3	2	TD
DTR	4	20	DTR
SG	5	7	SG
DSR	6	6	DSR
RTS	7	4	RTS
CTS	8	5	CTS
RI	9	22	RI

Note: This is the standard AT modem cable.

PC-TO-PRINTER CABLE

PIN NUMBER OF CONNECTOR TO PC (female, DB25S, for IBM- PC)		PIN NUMBER OF CONNECTOR TO PRINTER (male or female, as needed)	
shield	1	wire shield not connected this enc.	
TD	2	3	RD
RD	3	2	TD
RTS	4	6	DSR
		8	DCD
CTS	5	20	DTR
		11 (TI)	
		19 (NEC)	
DSR	6	4	RTS
DCD	8		
SG	7	7	SG

HP260-TO-MODEM CABLE

PIN NUMBER OF CONNECTOR TO HP260 (male, DB25P)		PIN NUMBER OF CONNECTOR TO MODEM (male, DB25P)	
shield	1	wire shield not connected this enc.	
TD	2	3	RD
RD	3	2	TD
RTS	4	4	RTS
CTS	5	5	CTS
DSR	6	20	DTR
SG	7	7	SG
DCD	8	8	DCD
DTR	20	6	DSR

Note: This cable is equivalent to HP's 45111A (except for straight through wiring of pins 22 and 23 which are not supported on the HP260).

APPENDIX B -- CONTROL CHARACTERS

HP ASCII CHARACTER DISPLAYED	HP CONTROL KEY	IBM CHARACTER DISPLAYED
NU (NULL)		blank
SH (SOH)	EXECUTE	SAD FACE
SX (STX)	ENTER	HAPPY FACE
EX (ETX)		HEART
ET (EOT)	TAB SET	DIAMOND
EQ (ENQ)	SHIFT CLEAR	CLUB
AK (ACK)		SPADE
BELL	TAB CLEAR	FILLED CIRCLE
BS	BACKSPACE	INVERSE OF FILLED CIRCLE
HT	TAB FORWARD	UNFILLED CIRCLE
LF	NEW LINE	INVERSE OF UNFILLED CIRCLE
VT	TAB BACKWARD	MALE SIGN
FF	SHIFT NEW LINE	FEMALE SIGN
CR		MUSICAL NOTE
SO	HOME	MUSICAL NOTES
SI	SHIFT HOME	STARBURST
DL (DLE)	UP ARROW	RIGHT WEDGE
D1 (DC1)	DOWN ARROW	LEFT WEDGE
D2 (DC2)	SHIFT UP ARROW	UP/DOWN ARROW
D3 (DC3)	SHIFT DOWN ARROW	!!
D4 (DC4)	LEFT ARROW	PARAGRAPH SIGN
NK (NAK)	RIGHT ARROW	SECTION SIGN
SY (SYNC)	SHIFT LEFT ARROW	LOW BOX
EB (ETB)	SHIFT RIGHT ARROW	UP/DOWN ARROW WITH FLOOR
CN (CAN)	CLEAR	UP ARROW
EM	SHIFT CLEAR	DOWN ARROW
SB (SUB)	CONTROL CLEAR	RIGHT ARROW
EC (ESC)	ESCAPE	LEFT ARROW
FS	DELETE CHARACTER	LOWER-LEFT CORNER
GS	DELETE LINE	LEFT/RIGHT ARROW
RS	INSERT CHARACTER	UP WEDGE
US	INSERT LINE	DOWN WEDGE

APPENDIX C -- MEASURED HP260 WORKSTATION DATA RATES

WORKSTATION TYPE	WITHOUT SCROLLING		WITH SCROLLING	
	Effective Rate, baud	Relative to 9600 baud	Effective Rate	Relative to 9600 baud
HP25262D VIO Monitor	12,000	125%	4,600	48%
Model 35 Console	8,800	92%	7,600	79%
HP2622D	4,400	46%	3,800	40%
HP Vectra with WS260™	4,400	46%	3,800	40%
IBM-PC with Monochrome adapter and WS260™	4,400	46%	3,750	39%
IBM-PC with Color adapter and WS260™	4,400	46%	3,500	36%

Notes:

All tests were run with communications at 9600 baud. (The first two displays, of course, do not use serial communications and ran at their own set speeds.) The handshaking protocol and workstation control character overhead reduce the effective throughput according to the speed and load of the processor in the workstation, giving the effective values shown.

Tests involved writing full 80-character lines. Effective rates were calculated by dividing the number of bits corresponding to the number of characters actually written to the screen by the time taken. All workstation overhead characters are included implicitly and contribute to the degradation from the 9600 baud potential.

Use of PCs with higher clock rates (above 4.77Mhz) will not increase the scrolled rates much since the effective rates of 4400 baud (unscrolled) and 3800 baud (scrolled) appear to be maxima determined by the workstation overhead characters. Not until HP increases the nominal 9600 baud rate to 19.2 kilobaud will we see much throughput improvement on the asynchronous workstations.

**APPENDIX D -- IBM-PC KEYBOARD SCAN CODE AND SHIFT COMBINATIONS
 USED TO IMPLEMENT HP250/260 FUNCTIONS IN WS260™**

PC SCAN CODE	PC KEY	SHIFT STATUS	HP260 FUNCTION
----	-----	-----	-----
0	none		invalid key
1	Esc		EXECUTE
2	1, !		equivalent
3	2, @		equivalent
4	3, #		equivalent
5	4, \$		equivalent
6	5, %		equivalent
7	6, ^		equivalent
8	7, &		equivalent
9	8, *		equivalent
10	9, (equivalent
11	0,)		equivalent
12	-		equivalent
13	=		equivalent
14	Backspace		BACKSPACE
15	Tab		FORWARD TAB
		S	BACKWARD TAB
		A	SET TAB
		S A	CLEAR TAB
16	q, Q		equivalent
17	w, W		equivalent
18	e, E		equivalent
19	r, R		equivalent
20	t, T		equivalent
21	y, Y		equivalent
22	u, U		equivalent
23	i, I		equivalent
24	o, O		equivalent
25	p, P		equivalent
26	[, {		[, [
27], }],]

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28	Return		ENTER
29	Ctrl		CTRL, not available to reprogram
30	a, A		equivalent
31	s, S		equivalent
32	d, D		equivalent
33	f, F		equivalent
34	g, G		equivalent
35	h, H		equivalent
36	j, J		equivalent
37	k, K		equivalent
38	l, L		equivalent
39	;, :		equivalent
40	' , "		equivalent
41	\, ~		not available on HP260
42	Left Shift		SHIFT, not available to reprogram
43	\,		not available on HP260
44	z, Z		equivalent
45	x, X		equivalent
46	c, C		equivalent
47	v, V		equivalent
48	b, B		equivalent
49	n, N		equivalent
50	m, M		equivalent
51	., <		equivalent
52	., >		equivalent
53	/, ?		equivalent
54	Right Shift		SHIFT, not available to reprogram
55	*,PrtSc		CLEAR LINE
		S	CLEAR FROM CURSOR DOWN
		C	CLEAR TO END OF LINE
		SC	CLEAR ALL
56	Alt		not available on HP260, not available to reprogram
57	Space Bar		equivalent
58	Caps Lock		CAP LOCK, not available to reprogram
59	F1		SFK1
		S	Emulator Configuration Screen
		C	Alternate Character Set on
		SC	Alternate Character Set off
		A	Emulator Direct ASCII Mode
60	F2		SFK2
		S	Exit Emulator

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		A	Emulator Exit-to-Shell
61	F3	S	SFK3
		A	Close Emulator Files
62	F4	S	Emulator Toggle ACK
		C	SFK4
		SC	Print Screen on PC printer
63	F5	C	Display Functions on
		SC	Display Functions off
		S	SFK5
		C	Toggle Emulator Status Line
64	F6	SC	Inverse Video on
		S	Inverse Video off
		C	SFK6
		SC	Emulator Cycle Log 10 Type
65	F7	C	Blinking on
		SC	Blinking off
		S	SFK7
		C	Emulator Toggle Send File on/off
66	F8	SC	Underline on
		S	Underline off
		C	SFK8
		SC	Labels Display
67	F9	C	Half-Bright on
		SC	Half-Bright off
		S	RESUME
68	F10	A	Emulator Drop DTR
69	NumLock		CYCLE
			not available on HP260,
			not available to reprogram
70	Scroll Lock, Break		HALT
		S	SHIFT HALT
		C	CTRL HALT
71	Home, 7		HOME
		S	SHIFT HOME
		N	7
72	Up Arrow, 8		UP ARROW
		S	PAGE UP
		N	8
73	PgUp, 9		PAGE UP
		N	9
74	-		equivalent
75	Left Arrow, 4		LEFT ARROW
		S	SHIFT LEFT ARROW
		N	4

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76	, 5		nothing
		N	5
77	Right Arrow, 6		RIGHT ARROW
		S	SHIFT RIGHT ARROW
		N	6
78	+		PAD-ENTER
		C	CTRL PAD-ENTER
79	End, 1		NEW LINE
		N	1
80	Down Arrow, 2		DOWN ARROW
		S	PAGE DOWN
		N	2
81	PgDn, 3		PAGE DOWN
		N	3
82	Ins, 0		INSERT
		S	INSERT LINE
		N	0
83	Del, .		DELETE
		S	DELETE LINE
		N	.

Notes:

Shift Status abbreviations are

S=Shift, C=Ctrl, A=Alternate, N=NumLock

Not all meaningful shifting combinations are shown. For example, Shift Lock affects only the alphanumeric keys, not functions, and is not shown.

NOTES

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