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PRODUCT: WordPerfect VERSION: 5.1 RELEASE DATE: 6/29/90
SUBJECT: Print To Hardware Port - Guidelines

Print to Hardware Port (PTHP)
A new feature on the WP5.1 6-29-90 Program 1/2

Normally, when WordPerfect sends data to a printer, it does so though the BIOS (Basic Input/Output Services) serial and parallel services. Using the BIOS services allows compatibility with a very wide range of hardware configurations.
The fastest way (as much as 30% faster) for a program to send data to a directly-attached printer is for the program to bypass the BIOS services, and print directly to the serial or parallel port using interrupts (the hardware).

How WordPerfect sets up Print to Hardware port:

WordPerfect will read a table, that the IBM PC BIOS keeps, of base port addresses for serial and parallel ports. Normally, WordPerfect can read this table and use the addresses to know how to communicate with the serial and/or parallel ports. Unlike the Base Address WordPerfect automatically sets up the IRQ levels to the following:
LPT Ports = IRQ 7
COM1 = IRQ 4
COM2 = IRQ 3
COM 3&4 are not setup automatically. (If they are used then the user must go into the Advanced Setup and set the IRQ level to their manufacturer's setting.)

It is possible that the BIOS might not be able to find certain expansion boards and enter the Base Address in the table. In this case, the user must use the Print to Hardware Port Advanced Setup menu and tell WordPerfect what the Base Address is for the serial or parallel port in question. This information can be obtained from the I/O(Input Output) card board documentation (ie... in the index under I/O port, parallel, serial, com, I/O (base) address).

Guidelines

1.   If the user cannot print from DOS or with PTHP set to no, choosing Yes for print to hardware port may not allow them to print. This will enhance printing if they are already able to print.

2.   Print to Hardware Port cannot be used with capture, print spooling programs, or TSR printing programs. (ie...Glyphix, PowerPak)

3.   If PTHP is set to yes, and Printer Control says the status is printing but nothing ever prints, you probably need to go into Advanced Setup and change the IRQ level. In many cases, WordPerfect has sent a character but is not receiving the interrupt to continue printing. To find out the proper IRQ level and base port address, users will

have to refer to the documentation for the parallel/serial I/O card.

Printing to a parallel port using an AT compatible Computer: If the base address defaults to 278h try IRQ 5.

4.   If users have referred to the documentation and everything seems to be correct with the base port address and IRQ level, and it still doesn't work there are several options:

   a.   Boot vanilla and make sure there is nothing conflicting (eg. network boards use an interrupt that might conflict.)

   b.   Contact the manufacturer of the board to see if there is any known problem with interrupt handling. (Some of the original IBM monochrome graphics adapters and their clones do not consistently generate interrupts.)

5.   Choosing incorrect interrupt levels in Advanced Setup may cause the computer to hang.

Note:
Generally, the BIOS will find the Base Address of most LPT and COM ports. However, there is no easy way of determining what the IRQ level is if the IRQ level is not the default. If the user does not know what the IRQ level is for the board, and it is a board that allows the IRQ level to be configured, the only way to determine the IRQ level is to remove the board and look at the jumper/switch block settings and compare them with the illustrations or descriptions in the board manual.

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Purpose:

To speed up printing to local printers through interrupt-driven printing. This features will make the most significant difference when printer complex data, graphics, tables, etc.

How Print To Hardware Port Works:

1.   Normally when WordPerfect prints is uses a process called polling. WP asks (polls) the ROM BIOS if the printer is ready for another character and WP must wait for the BIOS to tell it if the printer is ready for another character. The BIOS will continually look back and forth between the printer and WP to see when the printer is ready for another character. This polling back and forth substantially slows down the printer process.

2.   Print to Hardware Port uses a process called hardware interrupt, instead of WP repeatedly polling the BIOS. The printer lets WP do other things and interrupts WP for a split second to inform WP that the printer is ready for another character (much like a keyboard interrupts a program to put a character on the screen). WP then sends another character when the printer is ready. This speeds up printing by as much as 30 percent.

User Interface:

This feature is selected from the Select Printer: Edit menu. The default is set to No so as not to interfere with users' current hardware setup. In most cases, to turn on hardware printing, users should just have to select the Yes menu option. One exception to this is when selecting Print to Hardware Port for Com3 and Com4. WP can make no assumptions about the base port address and IRQ level for those ports. When selecting Print to Hardware Port for Com3 and Com4, users will be forced to go into Advanced Setup. If users' serial or parallel ports are configured to an IRQ level or base port address different than WP assumes is default, they will have to use the Advanced Setup option.

Advanced Setup Menu:

IRQ Levels

Since there are many things that cause interrupts (i.e. keyboards, clock chip etc.) the CPU has to know where a particular interrupt is coming from to do a certain task.

The default settings for IRQ levels are:

LPT ports = IRQ 7
LPT2 for AT's = IRQ 5 (only in certain cases, see card documentation)
COM1 = IRQ 4
COM2 = IRQ 3

When the software receives a code from a peripheral device, it must distinguish which device sent the code. A perripheral sends a signal, a certain tone or pitch, that is unique to that device. The technical term is Interrupt Request Levels. The standard signals are:
IRQ0 - Clock Chip. This keeps time for the PC
IRQ1 - Keyboard
IRQ2 - Reserved (many network adapters use this)
IRQ3 - COM2
IRQ4 - COM1
IRQ5 - Hard disk on the PC, LPT2 on some AT machines that have a combined serial/paralled board.
IRQ6 - Diskette on PC, Hard disk & diskette on AT
IRQ7 - LPT1

In some cases a person may have a device (i.e. modem) which will give them additional COM ports (i.e. COM3 and COM4). The documentation of the card will tell the proper IRQ setting and must be set in the advanced setup menu. There are no assumptions that WordPerfect can make about either COM3 or COM4. Because of this, the Yes option on the print to Hardware Port menu is non-functional. Only No and Advanced Setup are allowed. When Advanced Setup is chosen, Yes is automatically

Base Port Addresses

There also has to be a way for the CPU and expansion boards to exchange information. The CPU must know which I/O port to use for a particular application. This is known as the base port address. Normally WP reads a setup from the BIOS, which contains the correct base port addresses of certain I/O devices, which include the existing serial and parallel ports.

Sometimes the BIOS is unable to read the base port address of additional expansion boards such as the ones mentioned above. Again the documentation of the card will tell the proper base port address and must be set in the advanced setup menu.

The base port address use hexadecimal numbers to specify their location.

LPT1 = 3BCh (for parallel ports on video cards)
LPT2 = 378h (or LPT1 if there is no parallel port on the video card)
LPT3 = 278h (or LPT2 if there is no parallel port on the video card)

COM1 = 3F8h
COM2 = 2F8h

Startup Options:

/bp = # The size of the buffer used for the output stream has an impact on print speed when using Print to Hardware Port. The # is a value from 0 to 63 K, in increments of 1. WP sets the default buffer size at 512 bytes (1/2K), but this can be changed for documents with many graphics, tables, etc. Larger buffer sizes must be used with caution because if too much buffer is used, the printer may give an "Out of Memory" error. If little memory is available, a bigger buffer size may actually slow down the job because it is stealing away memory that could be used to format the data for printing. Setting the buffer size to zero disables hardware printing for that session of WP.

/nh Disables hardware printing. With the addition of hardware printing, upon startup WP makes new calls to hardware that are incompatible with some older BIOS versions, causing the computer to lock. This will happen whether Print to Hardware Port is set for No or Yes. If users lock upon startup, try /nh/nc/nk (NOTE: If /nc/nk is necessary to run WP, /nh will also be necessary). To disable hardware printing simply use /nh.

Troubleshooting:

1.   If the user cannot print from DOS or with Print to Hardware Port set to No, choosing Yes for Print to Hardware Port will not allow them to print. This will enhance printing if they are already able to print.

2.   Print to Hardware Port cannot be used with capture or print spooling programs since these generally use the BIOS interface.

3.   If Print to Hardware Port is set to Yes, and Printer Control says the status is printing, but nothing ever prints, you probably need to go into Advanced Setup and change the IRQ level. In many cases, WP has sent some characters but is not receiving the interrupt to continue printing. To find out the proper IRQ level and base port address, users will have to refer to the documentation for the parallel/serial board.

4.   If users have referred to the documentation and everything seems to be correct with the base port address and IRQ level and it still doesn't work there are several options:
      a.   Boot vanilla and make sure there is nothing conflicting (eg. network boards can be configured to use interrupt that can conflict (IPX prints the IRQ level the network board is using upon startup.)
      b.   Contact the manufacturer of the board to see if there is any known problems with interrupt handling. (Some of the original IBM monochrome graphics adapters and their clones do not produce consistent interrupts with their

built-in parallel ports.)

5.   If the printer is printing garbage, someone is sending the printer garbage, or the printer lost a character somehow (for instance, part of a control sequence) and the printer is interpreting subsequent bytes of the control sequence as printable characters.

6.   Choosing incorrect interrupt levels in Advanced Setup can cause the computer to lock.

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