

Cogent 2000 Application Note

Accessing Windows 2000/XP I/O Ports

For security reasons, Windows 2000/XP “blocks” user programs from directly accessing hardware via port input/output commands. Only routines running within the relatively safe confines of the operating system itself are allowed to program system hardware via port I/O commands.

However, *Cogent 2000* release 1.25 includes a system utility that allows programmers to bypass this problem. By installing a free public domain kernel-level driver called *UserPort.sys* and accessing it via custom built-in functions (i.e., *outportb* and *inportb*), Cogent 2000 can be used to implement low-level interfacing to computer hardware and peripherals. The user must manually install the *UserPort.sys* driver prior to using the built-in port I/O functions (*outportb*, *inportb*). Note: The user must log into the computer in administrator mode in order to install this driver software.

Installation Instructions

1. Unzip the contents of the *UserPort.zip* distribution file to a temporary directory. The distribution consists of two programs:
 - UserPort.sys* - the kernel-level driver.
 - UserPort.exe* - the driver installation and configuration program
2. Copy *UserPort.sys* to the C:\windows\system32\drivers folder¹.
3. Run the *UserPort.exe* program. To enable the default port I/O addresses that the *UserPort.sys* driver can access click the **Start** button; and, then the **Exit** button to finish the installation. To define additional port addresses, enter the desired range in the text box (left column) and press the **Add** button. The new I/O port values should then appear in the summary list below.

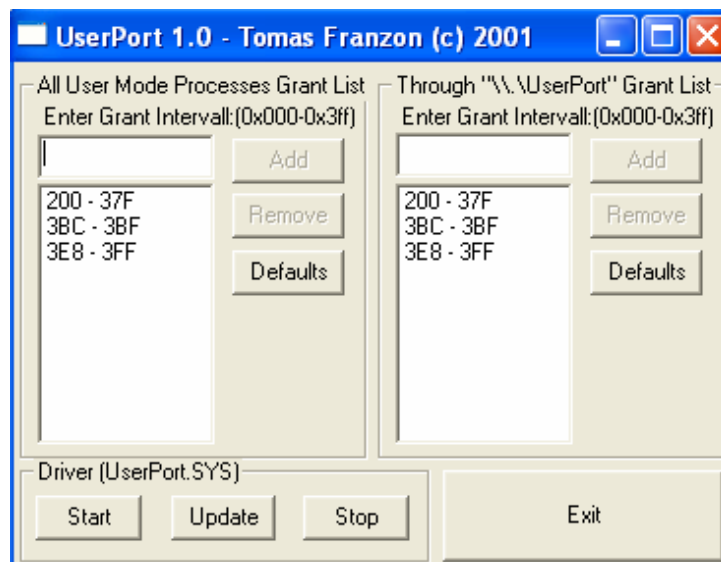


Figure 1. *UserPort.exe* User Interface

This completes the installation process. Once the driver is successfully installed, you need never run the *UserPort.exe* program again unless you want to change the range of I/O port addresses that can be accessed via the *UserPort.sys* driver.

Testing the *UserPort.sys* Driver

Run the **sample10.m** script located in the `~\Cogent2000v12.5\Samples` folder to see if the driver is functioning properly. This test script reads a list of 8 pictures (BMP files) and their respective “codes” from the *sample10.dat* file and sequentially displays each of these pictures. As each picture is displayed, its matching “code” is sent to the computer’s printer port (LPT1:) via the built-in **outportb**(888, data) command. The port address of 888 – in the familiar decimal format – is the equivalent of 0x378 (in less familiar hexadecimal format). This is the standard address of the LPT1: DATA port. Since 0x378 falls within the range of 0x200-0x37F (the first range of addresses granted special access permission by the *UserPort.exe* configuration program – see Figure 1) it should be legally accessible via the UserPort-enabled outportb() command.

If the **UserPort.sys** driver is not successfully installed, running the **sample10.m** script will result in a **Segment Violation** core dump (an error of extreme prejudice).

Note: Preliminary timing tests indicate that parallel port I/O from MATLAB via the Cogent 2000 **outportb()** and **inportb()** functions is EXTREMELY SLOW (i.e., 100 msec). A Java Native Interface package named **usd.IOReadWrite** has been developed as a work-around for this problem. Preliminary tests indicate that IOReadWrite.read() and IOReadWrite.write() provided MATLAB I/O access with latencies well below 1 msec.

Notice

CPU Hyperthreading must be disabled via the BIOS Setup program on newer Windows XP (SP2) computers that support hyperthreading. Otherwise, UserPort behaves quite badly.

Uninstalling UserPort:

(**Warning:** Mistakes while using *Regedt32* can disable your computer)

1. Run UserPort.exe and click STOP and then EXIT.
2. Delete C:\windows\system32\drivers\userport.sys
3. Remove the following entries from the registry via regedt32:
 ~\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Service\UserPort...
4. Reboot.

Notes:

- ¹The **UserPort.sys** driver needs to be placed in the standard system drivers folder. That folder is found at %WINDIR%\system32\drivers. The installation instructions above assume that %WINDIR% = c:\windows (Win XP default).