

## **How to create a bootable 1Gb CF card for a Fujitsu Siemens Futro S220 running DOS 6.2 and Windows 3.1**

### **Things you need to know before starting:**

- Even though I have written this document with as much step-by-step detail as possible, this procedure is NOT recommended for a novice. Some degree of understanding of how computers work at the system level is desirable in case things do not go according to plan (or do not work exactly as stated with your particular hardware) and you have to improvise. An understanding of DOS commands, what they do, which ones to use and their syntax will also be useful!!!
- The procedure described below for creating a bootable CF card is fairly standard and should also work with other models of thin client. The BIOS settings described in "Part C" are only for the Fujitsu Siemens Futro S220, however, so if you are attempting this on a different model you will have to experiment with different settings to see what works.
- For those of you who were not working with computers in the early 1990s, you may not know that Windows 3.1 is not actually an operating system. The computer does not boot from it like it does with modern versions of Windows which we see today. Back then Windows 3.1 was simply a program containing a graphical user interface (GUI) that allowed you to perform system level type operations without having to remember the actual DOS commands and syntax. The computer first boots into DOS and then you load up Windows 3.1 just the same as if you were loading a word processor, a spreadsheet program or a game etc. Exiting Windows 3.1 when you are finished simply returns you to DOS so you can then do something else, it does not shut down the computer.
- The good news is that there is a wide following for both DOS and Windows 3.1 on the internet, even after all these years! There are many websites where you can download software, drivers, utilities, games (and yes, even DOS and Windows 3.1 themselves) plus get help and lots of useful information. I have listed a few at the end of this document.

### **List of equipment you will need before starting:**

- Windows 7 (or later) computer with a CF card reader. The procedure described here will NOT work on Windows XP as one of the commands is not recognised.
- Access to the internet so you can download software and drivers etc.
- 1Gb CF card. (The Fujitsu S220 should support up to 4Gb, but DOS can only see maximum 2Gb partitions anyway and 1Gb will be easily more than enough!)

- External USB powered 3.5 inch 1.44Gb floppy disk drive.
- DOS master disks with one being bootable. Which version of DOS you use is entirely up to you, but I recommend at least MS-DOS 6.0 due to the better memory managers it comes with. There are two ways to get these disks:
  - a) The simplest and most fool-proof method is to buy a second-hand set on ebay, the first one in the set usually being the bootable one.
  - b) Download DOS disk image files from one of the websites listed at the end of this document and then create your own set. However, getting one to be bootable might prove difficult as you cannot simply copy the files from the images onto the disk, but need to actually write the boot sector as well. Depending on the Windows software you have, one possible solution could be to first create a DOS bootable CD or USB memory stick from these images, reboot your Windows computer onto that (thus turning it into a DOS computer), and from there you can then “system format” a floppy disk.
- Windows 3.1 master disks. Again either buy a second-hand set on ebay or create your own from downloaded disk image files (in which case you will need to buy a stack of blank 1.44Gb floppy disks instead!).
- A USB memory stick with a VERY small partition size (say 128Mb or 256Mb perhaps) if you intend to activate the USB ports on your thin client and use them for data transfer (see “Part F”). DOS works much better with these smaller ones (which are hard to find these days), it won’t read the standard ones with many Gb’s worth of storage. It has to be formatted for “FAT16” and not “NTFS”.

## Part A – Completely wipe the CF card:

Parts A and B of this procedure are done on your Windows 7 (or later) computer.

- 1) Boot Windows then insert the CF card into the reader.
- 2) Open a command prompt window and type in the following commands:

```
Diskpart
List disk
Select disk # (the number shown for the CF card)
Clean
Exit
```

Note: The “clean” command wipes the disk you have selected, so be absolutely 100% certain you have selected the CF card and not your Windows hard drive!!!

- 3) Close the command prompt window.

## Part B – Partition and format the CF card:

4) Open the disk management console. This can be done by right-click-manage from the “My computer” icon, or typing “compmgmt.msc” from the Run window.

5) Select the CF card. It should show as “unallocated space” of 974Mb and will probably have the same disk # as used in “diskpart” above.

- Right-click “new simple volume”.
- Select the maximum size available.
- Assign the default drive letter (do not select NTFS).
- Select format the volume as FAT (not FAT32).
- Select default allocation unit size.
- Type in a volume label if desired.
- Select quick format.
- Check all selections, then go ahead and format the CF card.
- Once complete it should show as “healthy primary partition”.

Again, be absolutely 100% certain you are formatting the CF card and not your Windows hard drive!!!

6) Exit the disk management console and safely eject the CF card.

## Part C – Create the boot sector of the CF card:

The remainder of this procedure is performed on the Fujitsu S220.

7) Install the CF card into the Fujitsu S220 and also plug in the USB floppy disk drive. Switch on and press F2 to access the BIOS. The card should register as “secondary master 973Mb” for a 1Gb CF card.

- Select “Disks” on top menu bar.
- Select IDE settings.
- Set HDD timing to “Standard”.
- Select “Boot” on top menu bar.
- Select boot sequence.
- Make sure “USB floppy” is the first item to boot from.
- Select “Boot” on top menu bar again.
- Select IDE boot order.
- Make sure the CF card is the first item to boot from.

8) Insert the bootable DOS floppy disk you obtained earlier.

- Select “Exit” on the BIOS top menu bar.
- Select save and exit. The machine will reboot immediately you select OK.

9) After booting on drive A:, check that the CF card is accessible as drive C: with a simple command like “dir c:”. Don't worry if it says “file not found”, this is because the CF card is currently blank. If it returns to drive A: with no errors, then that means the CF card has been recognised as drive C: and is ready to proceed.

10) Now create the boot sector on the CF card drive C: with these two commands:

sys c:

fdisk

- Select 2 to set the partition as active in order to boot from it.
- Enter the partition number which should be 1, with 972Mb and FAT16 shown.
- “Status” should now change to A, so press ESC to continue.
- Select 4 to display partition information. It should say “active primary DOS”.

11) Exit from fdisk and reboot the machine on the floppy drive again.

12) After rebooting, remove the floppy disk and reboot a second time onto drive C: Confirm it has worked with a simple command like “dir c:”. Congratulations, you should now have a totally blank 1Gb CF card booting on DOS and ready for use!

## Part D – Install and configure DOS:

13) Complete the installation of DOS. There are two options:

- a) If you are using a set of DOS master disks, then you will need to go through the installation program. This is because the files on those disks are not in a “ready to use format” and the install program has to adjust them first. Boot the computer from disk 1 in the set and follow the installation program's instructions.
- b) If you are not using a set of DOS master disks, then simply create a “C:\DOS” directory on your CF card and copy all your “ready to use” DOS files across.

14) Remove all floppy disks and reboot the machine again. If you installed DOS from the master disks then a CONFIG.SYS file will have been created for you. If not, then you need to write one yourself. This needs to be stored in the root level “C:\”. From this level you can access the basic text editor that comes with DOS by typing in “DOS\EDIT CONFIG.SYS”. This will create a new blank file called CONFIG.SYS, and here is a very basic one you can now type in yourself:

```
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH,UMB
DEVICE=C:\DOS\EMM386.EXE
FILES=100
BUFFERS=50
STACKS=9,256
DEVICEHIGH=C:\DOS\MOUSE.SYS
COUNTRY=44,,C:\DOS\COUNTRY.SYS ***see note***
```

15) If you installed DOS from the master disks then an initial AUTOEXEC.BAT file will also have been created in the root level "C:\". Alternatively you can create your own with the command "\DOS\EDIT AUTOEXEC.BAT", and here is a very basic one to get you started:

```
@ECHO OFF
LOADHIGH C:\DOS\KEYB UK,,C:\DOS\KEYBOARD.SYS ***see note***
PATH C:\DOS
SET DIRCMD=/OGN
SET TEMP=C:\TEMP
SET TMP=C:\TEMP
VER
PROMPT $p$g
```

\*\*\*Note\*\*\* Both these two files are set for using the UK character set and a UK style keyboard. If you are in a different country then you need to change the country code "44" and the "UK" in the two lines indicated above in red. A list of which codes to use for which countries can be found here:

<http://manmrk.net/tutorials/DOS/help/country.htm>

<http://manmrk.net/tutorials/DOS/help/keyb.htm>

## Part E – Install and configure Windows 3.1:

16) Reboot the computer and make sure no errors from CONFIG.SYS or AUTOEXEC.BAT appear. Correct any that do.

17) Using the Windows 3.1 master disks you obtained earlier, run the installation program (which is usually contained on disk 1 of the set). It is best to do it this way and not attempt to copy files across from a working version of Windows 3.1 on another computer, because a lot of configuration is required that is specific to the machine it is being installed on. Note that this installation procedure will also make a few changes to your CONFIG.SYS and AUTOEXEC.BAT files, so you may need to go back and edit them again if there are any boot-up problems afterwards.

18) Once installation is complete, remove all floppy disks and reboot. To run the Windows 3.1 program you simply type in "WIN". From here you can change all sorts of settings to configure the software how you want it. Unfortunately, from this point forwards, you are on your own! I cannot predict what errors may occur (if any) so I cannot, therefore, instruct you how to correct them! Hopefully there won't be any and Windows 3.1 should load correctly, although if any errors are encountered it is most likely they could be caused by the memory managers HIMEM.SYS and EMM386.EXE. These are contained in the CONFIG.SYS file and may need to be reconfigured to avoid any memory address conflicts – I thus reiterate my opening paragraph that this is not a job for a novice and some knowledge of how early 1990's computers work will be required!

## Part F – Add USB support for DOS:

To activate the USB ports to work under DOS you will need two system drivers called USBASPI.SYS and DI1000DD.SYS. These are not supplied on your DOS master disks because USB had not yet been invented back then! Instead you can find them at the following website:

[http://www.dosdays.co.uk/topics/usb\\_support.php](http://www.dosdays.co.uk/topics/usb_support.php)

19) Download these files using your Windows computer. (If they come in a ZIP format, then unzip them before continuing). Transfer them across to the Fujitsu S220 via a floppy disk. Create a new directory called "C:\USB" to store them in.

20) Edit your CONFIG.SYS file and add the following commands at the end:

```
DEVICEHIGH=C:\USB\USBASPI.SYS /v /e /w  
DEVICEHIGH=C:\USB\DI1000DD.SYS
```

Note: They may work better if not loaded into high memory instead (i.e. remove the word HIGH from the two commands). Some trial and error may be needed to find the best place to insert these commands and the best switches to use with them.

Here are a few important things to note about using USB ports in DOS:

- a) It is not "plug and play". Unlike a modern Windows computer, you cannot insert and remove USB memory sticks as and when you want to. DOS will only scan the USB ports for a memory stick when the above two system drivers are being loaded, which is at boot-up time only. Hence the USB memory stick must be inserted the whole time and not removed until the computer is turned off again.
- b) As previously stated, DOS does not like large partition sizes so will only read the smaller USB memory sticks. I found that 128Mb or 256Mb ones work best (if you can find any that small these days!), and they should be formatted using your Windows computer for FAT16 only.
- c) On the Fujitsu S220, a number of errors appeared as the two system drivers were being loaded and DOS scanned the USB ports for available memory sticks. Despite this, they still went ahead and assigned drive letter D: to the plugged in memory stick and it worked just fine afterwards! This could be an issue with the Fujitsu S220 only and it may not occur on other models of thin client.
- d) On the Fujitsu S220, an issue was discovered that if you have the USB memory stick inserted when you switch on then the machine will try to boot from it, despite the fact the BIOS is not capable of doing so! It thus fails, ignores your nice bootable drive C: and attempts to boot from a network which isn't present instead! The solution is not to insert the USB memory stick until you are prompted to do so (which is what the "/w" switch of the system driver does).

e) On the Fujitsu S220, another issue was discovered in that Windows 3.1 will not run when the two USB drivers are loaded. I believe this might be some form of memory conflict and have so far been unable to resolve it. This is most annoying as it means you can run the computer with either USB support or Windows 3.1, but not both together. The only viable solution was to rewrite the CONFIG.SYS file with a “dual boot menu”, such that when the computer boots-up you are given the choice of loading the USB drivers or not. (Again, not a task for a novice, although with some internet research you could learn how to write this.) As before, this problem could be unique to the Fujitsu S220 and may not occur on other models of thin client.

## Part G – Slow down some of your DOS programs:

At this point your project is now complete and you have recreated an early 1990's style computer using a thin client. The only real difference is that everything runs incredibly quickly as your machine is rated at 800Mhz (for the Fujitsu S220) as opposed to the 25Mhz or so we had back in those days! For most software this is not a problem (it's an added bonus in fact), but some older programs simply will not run at that speed or are completely unusable if they do. This is particularly true if you want to run DOS games, most of which require the user to perform some kind of action within a short space of time. As such you need to slow down the computer first before loading them, in some cases drastically slow it down!

There are a variety of DOS utilities available for this which can be found here:

<http://www.sierrahelp.com/Utilities/SlowdownUtilities.html>

For my project I chose to use ones called “Throttle” and “SlowDOS” which can both be downloaded from here:

<http://www.oldskool.org/pc/throttle/DOS/>

Note that “Throttle” only works with certain chipsets so it might not be compatible with the model of thin client you have. The webpage contains a list of chipsets it is known to work with, the Fujitsu S220 for example having the “VIA 8235 Southbridge” which is one of those listed.

If “Throttle” does not work for you, then “SlowDOS” can also be accessed right at the bottom of the same webpage. This utility uses a completely different method by adding a quantity of 0.05ms time delays to the CPU clock which you can set yourself. A combination of both these utilities together can provide the best results.

Both of these utilities are freely available for personal use, and I hereby acknowledge the expertise of their creator whom I believe is called Jim Leonard. Thanks Jim!!!

*This document was created by Clive A. Norman in March 2022.  
All links to webpages were tested as working at that time.*

## List of good websites for DOS/Windows 3.1 software and help:

P.J.'s Machines (download master disk images for DOS 6.2 and lots of other stuff)

<https://www.pcjs.org/software/pcx86/sys/dos/microsoft/6.20/>

WinWorld (download master disk images for DOS 6.2)

<https://winworldpc.com/product/ms-dos/620>

WinWorld (download master disk images for Windows 3.1)

<https://winworldpc.com/product/windows-3/31>

List of DOS commands, their function and syntax

<http://manmrk.net/tutorials/DOS/help/index.htm>

DOS Days, old PC computing resource (DOS software to download)

<http://dosdays.co.uk/index.php>

PC-Tools, quality coding

<http://pc-tools.net/dos/>

DOS games

<https://www.dosgames.com/>

Internet archive, software library (DOS games, but not all are downloadable)

[https://archive.org/details/softwarelibrary\\_msdos\\_games](https://archive.org/details/softwarelibrary_msdos_games)

DOS games archive

<https://www.dosgamesarchive.com/>

Download abandonware games for DOS and Windows

<https://www.abandonwaredos.com/>

My abandonware (DOS games)

<https://www.myabandonware.com/>

Old-Games.com (10,000+ DOS games to download)

<https://www.old-games.com/>

Internet archive, software library (download lots of Windows 3.1 programs)

[https://archive.org/details/softwarelibrary\\_win3](https://archive.org/details/softwarelibrary_win3)

My Windows page, abandonware and freeware

<http://www.mywindowspage.com/>

MDGx MAX Speed WinDOWS (and DOS) Tricks, Secrets, Bugs and Fixes

<http://www.mdgx.com/>