FIRST DRIVER STATION UTILITY LOADER RE-IMAGE INSTRUCTIONS

1   Introduction

This document describes steps to load the Driver Station (DS) v1.0 Utility Loader (UL). The UL can be used to re-image the DS, perform low-level operations on the board, or load alternate operating systems or user programs.

1.1 *** *Warnings* ***

The boot loader(s) are write-protected. Do not unlock these sections. Doing so may render the unit unusable.

Do not overwrite the released image(s) or otherwise modify these sections with your own code. Doing so may render you ineligible to compete.

Be careful when using some of the UL commands. For example, you should not set a system-defined input pin as an output as this could damage the Driver Station.

The steps listed here do not violate these warnings. To be safe, just follow the instructions.

1.2 Equipment

You need:
1) A means of communicating with the DS at a low-level. This document uses the DS USB Adapter Clip with supplied USB extension cable.
2) A PC. The host OS can be Windows® or Linux. Other OS may work, but have not been tested.

1.3 Software

You need:
1) A host PC terminal emulator program like HyperTerm, minicom, Kermit, etc.
2) The DS UL binary image.
   ftp://kwikbyte.com/pub/DS/binary/utilLoader.bin
   or
   http://www.kwikbyte.com/driverstation/binary/utilLoader.bin

3) The original factory firmware.
   ftp://kwikbyte.com/pub/DS/binary/raw_otb.bin
   or
   http://www.kwikbyte.com/driverstation/binary/raw_otb.bin

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1.4 Support

Please read the instructions carefully. If you have questions or helpful comments, please send them to driverstation@kwikbyte.com.

2 Re-image Instructions

2.1 Load the UL

The DS firmware provides a means of updating the system before the OS is loaded. During boot, the DS waits for two characters (must be caps) from the host: K B.

1) Insert the USB extension cable into a free USB port on the PC.

2) Insert the DS USB Adapter Clip on the end of the USB extension cable. Notice the little green LEDs flash on the Adapter Clip.

3) When using Windows®, a driver may be required to use the clip. In that case, see http://www.ftdichip.com/Drivers/VCP.htm. The device used is FT232R. Select your OS, understand the comments listed on the web page, download and install the driver.

4) The OS detects the Adapter Clip and reports that it is ready for use.

5) Start the terminal emulator: e.g., HyperTerm (Start -> All Programs -> Accessories -> Communications -> Hyperterm).

6) If asked, you do not have to make HyperTerm the default telnet program.

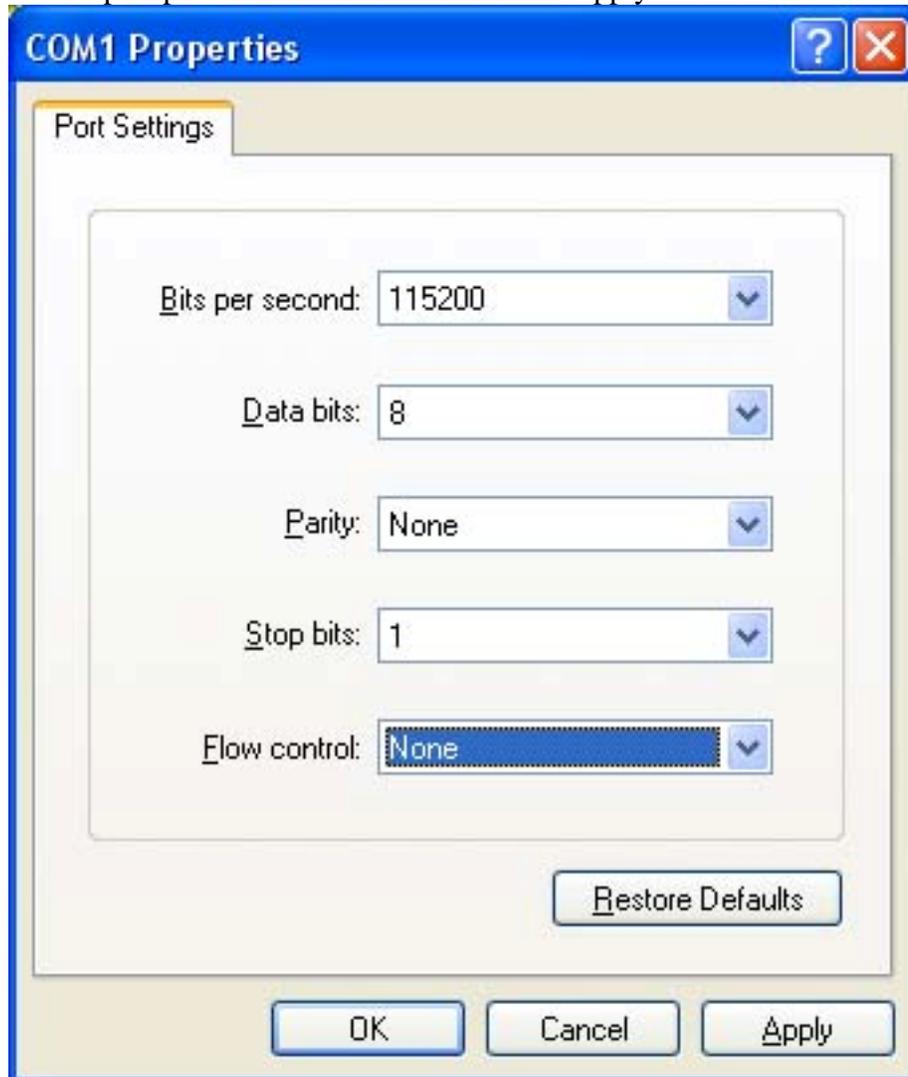7) Provide a meaningful name in the Connection Description and click OK.
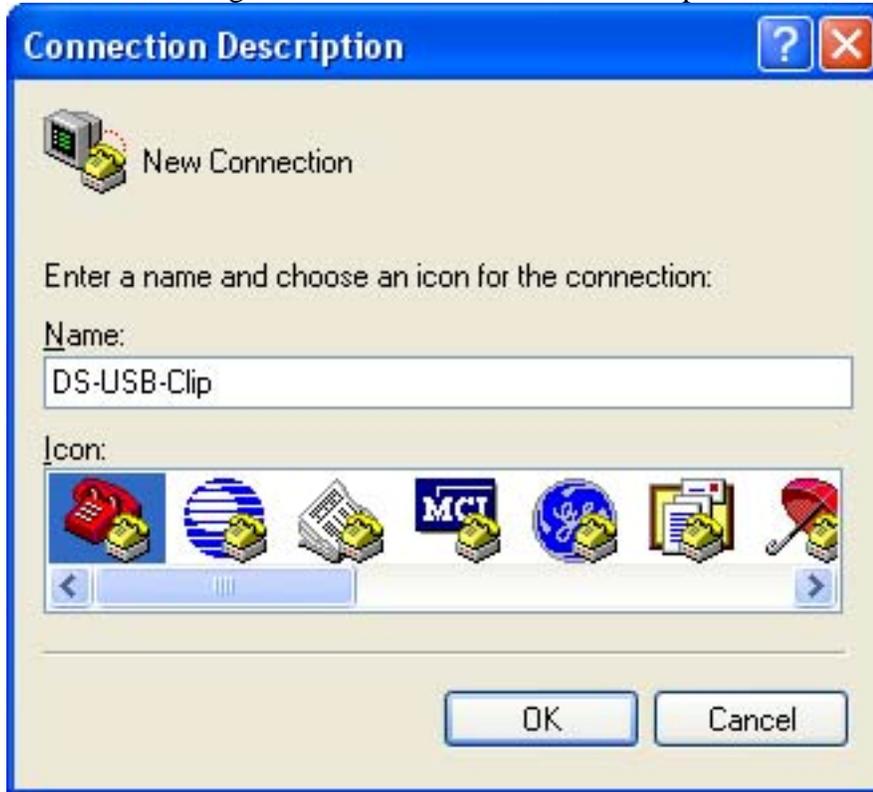
8) Depending on your computer configuration, the Adapter Clip may be recognized as a different serial port than the one shown. Trial and error will tell which port is correct. On many PCs, the last serial channel listed (e.g., COM4) is correct.

Select the port and click OK.

9) Set the port parameters as shown and click 'Apply' then click OK.

COM1 Properties

Port Settings

Bits per second: 115200

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

Restore Defaults

OK   Cancel   Apply

10) Now, you see an empty window.

11) Plug the Adapter Clip into the Driver Station Competition Port.

12) Apply power to the Driver Station by plugging-in the Driver Station power cord.

13) Now, you will see the output from the Driver Station. If not, you chose the wrong serial port. Close HyperTerm and go back to Step #5.
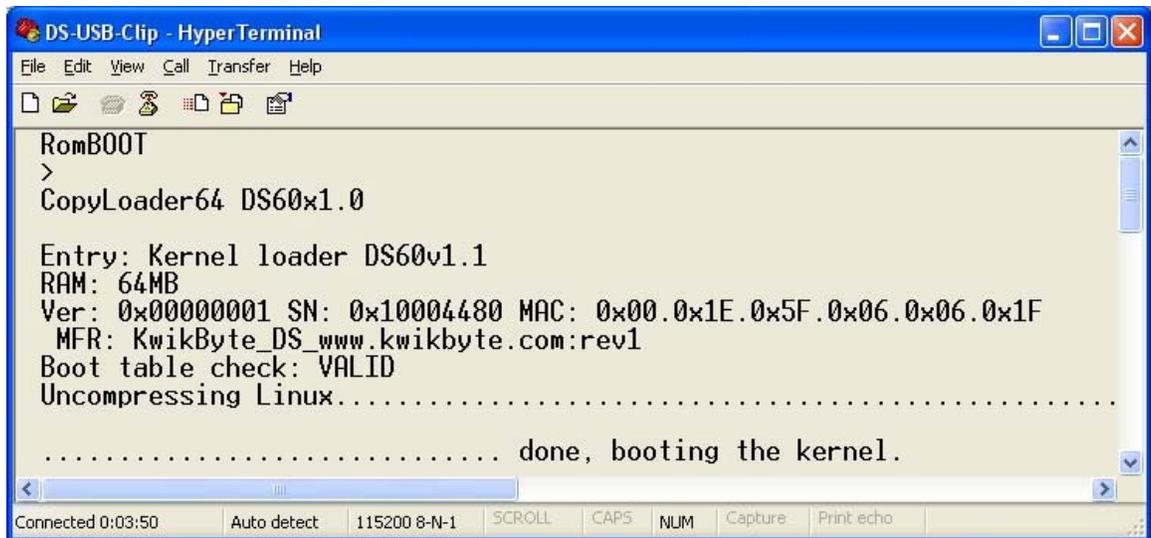
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14) Remove power from the Driver Station by unplugging the power cord.
Look at the first few lines of output. This is showing the Driver Station loading
the Linux kernel and beginning to boot the system! In the next step we will
trigger a secret hook in the "Kernel loader" by pressing some keys at the right
moment. Timing is important because the kernel loader only looks for these
characters for a short period before booting the normal system.

15) Get ready to type the two, capital case characters K B right after you see the
"RAM: 64MB" output on the screen. On the Driver Station, hold down all three
white pushbuttons (up, down, and select) – and keep them held down during this
step. Apply power to the Driver Station by plugging-in the power cord. As soon
as the "RAM:" line is output, type the two keys.

16) If you executed the previous step correctly, you now see the Driver Station
sending 'C' characters at about one per second. These characters continue until
you send the UL image to the Driver Station.
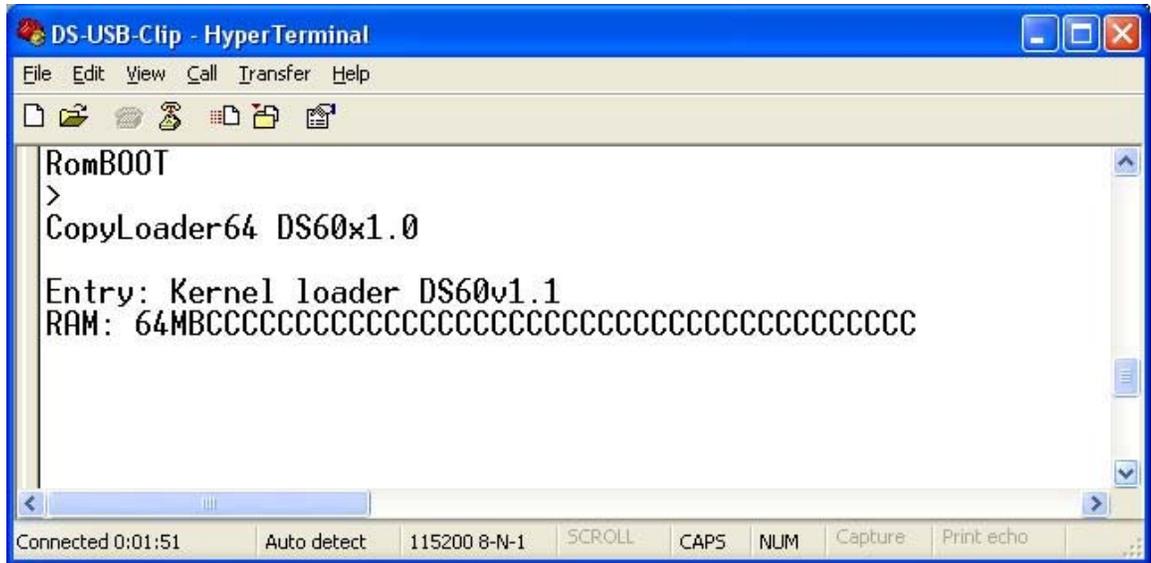
17) Send the utilLoader.bin file to the Driver Station by selecting Transfer -> Send File.
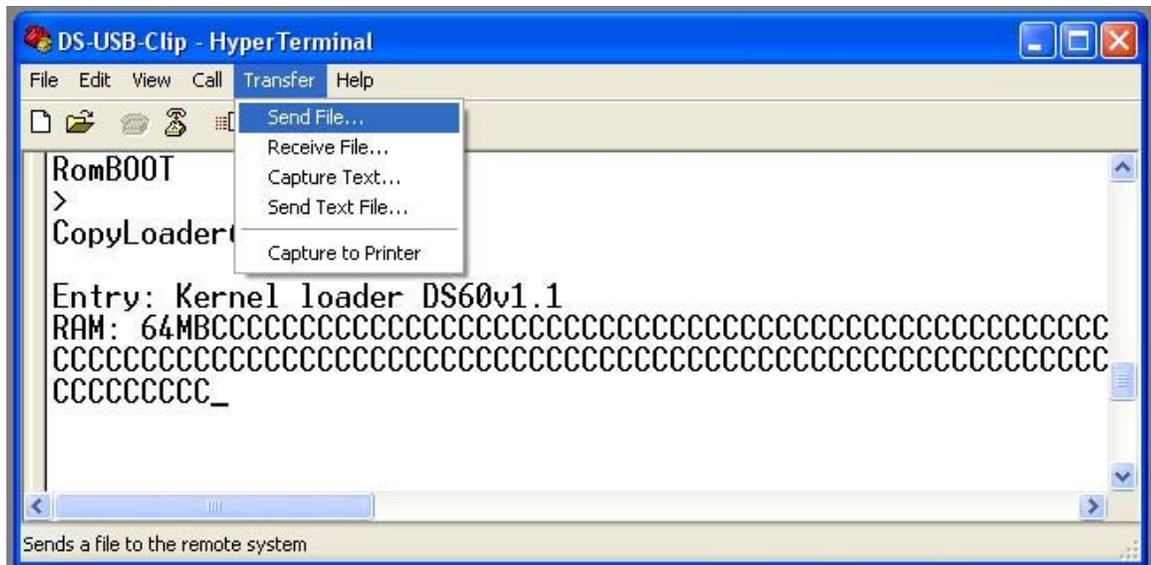
18) Select the file utilLoader.bin and set the transfer as Xmodem – this is **not** the same as 1K Xmodem. Then, click Send.
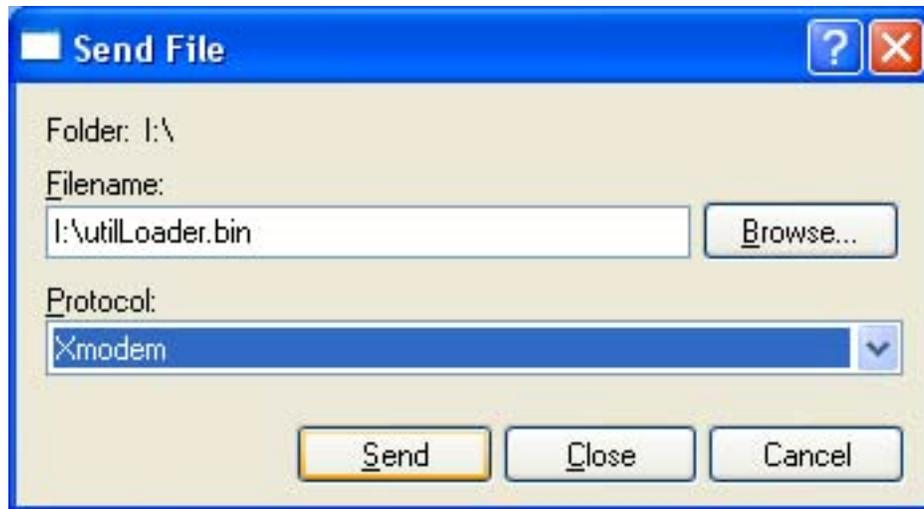
19) Watch the transfer progress. The first version of the UL takes about 12 seconds to download. You should see something like this after the download completes:

NOTE: The UL was not written specifically for network capability. Some Driver Stations correctly identify the dm9003 net chip. The network function will be used in a different document – when we boot a different Linux kernel and mount a larger file system on a USB stick. For now, we will use serial and just understand that Ethernet is a lot faster than serial!

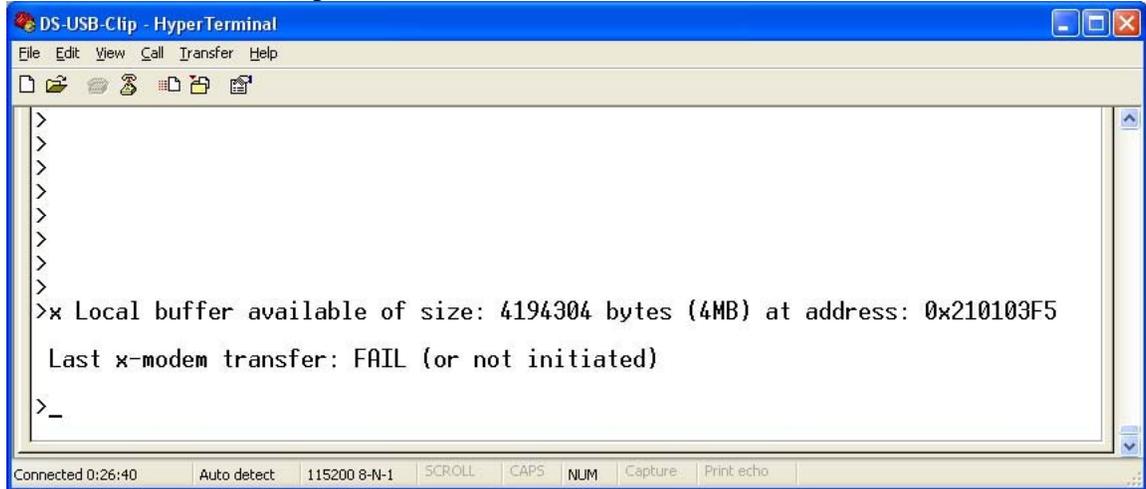The LCD display may also change when running the UL. This is normal.

20) Some *very* brief help is available with ? Enter.

NOTE: The UL will repeat the last command if you type only Enter without entering a new command.

Be careful! Some of these commands can damage the Driver Station if used
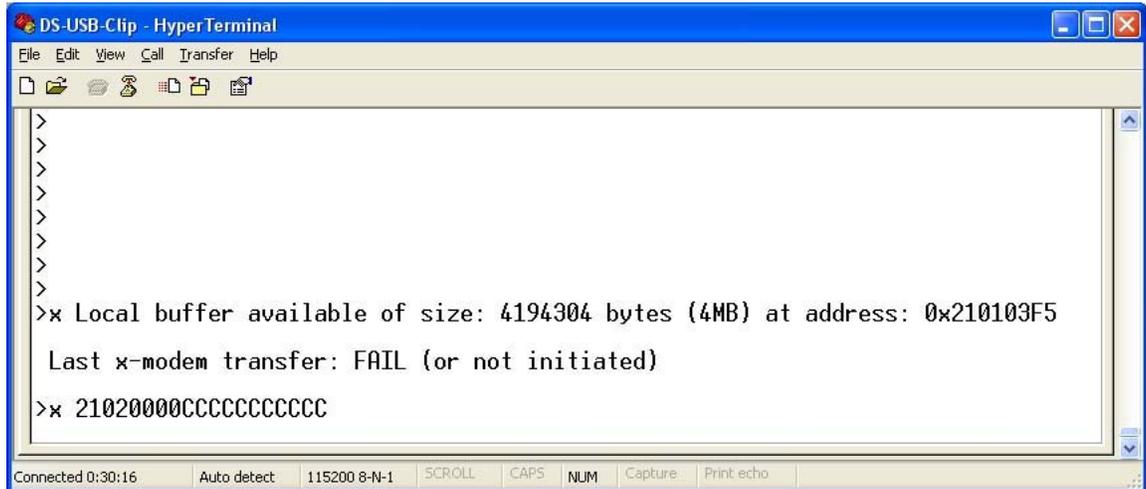
incorrectly.

21) Type <mark>x Enter</mark>. This reports the location of a free memory section we can use for download. In this example, the section is at 0x210103F5.

22) Let's initiate a download to receive the factory Driver Station Firmware. We will round-up the address provided by the buffer to a nice even number – 0x21020000. This works fine as long as the image to be received is less than the space allocated (4MB). Type <mark>x 21020000 Enter</mark>.

23) Now you see more 'C' characters indicating that the Driver Station is waiting for another Xmodem transfer.

24) As before, execute a transfer from the PC using Transfer -> Send File. Select the original raw_otb.bin Driver Station firmware for Xmodem download – just like we did earlier. Click Send and watch the progress. This will take a long time depending on the image size.

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25) The Driver Station now has the firmware image in RAM. We need to program it to non-volatile memory (NVM). The NVM used on the Driver Station is serial flash. Type x Enter to get the size of the last transfer from the Driver Station's view.
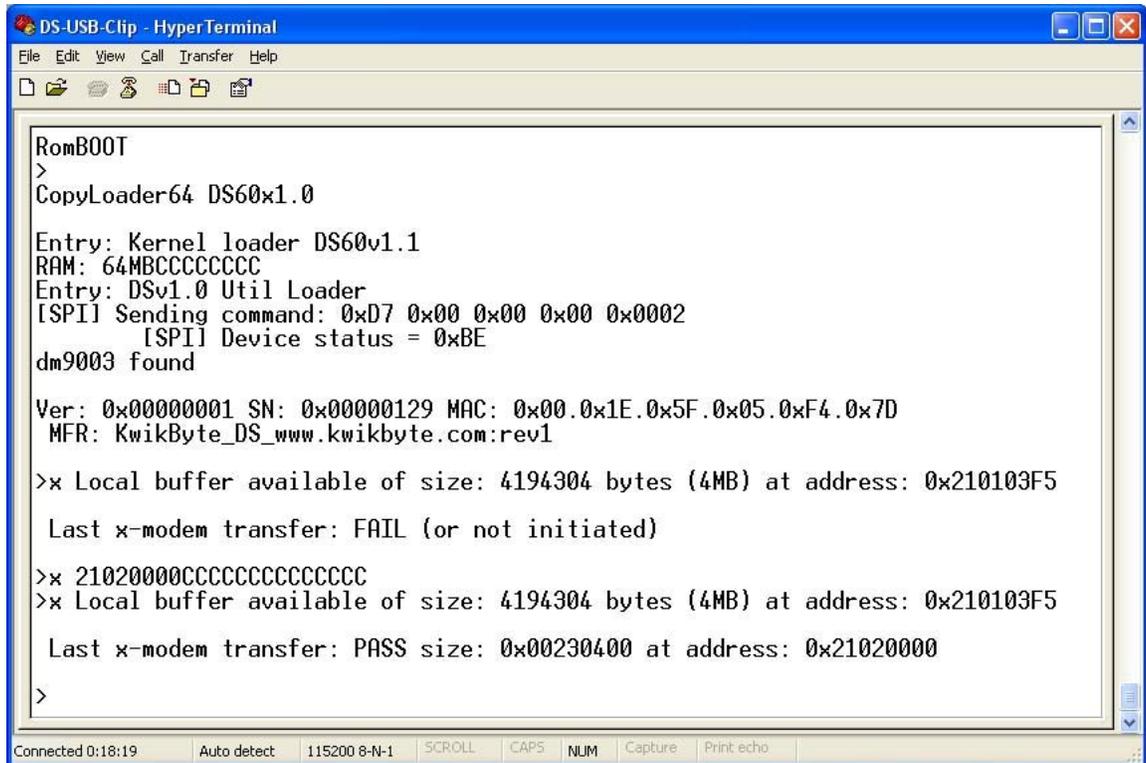
```
DS-USB-Clip - HyperTerminal
File  Edit  View  Call  Transfer  Help

RomBOOT
>
CopyLoader64 DS60x1.0

Entry: Kernel loader DS60v1.1
RAM: 64MBCCCCCCCC
Entry: DSv1.0 Util Loader
[SPI] Sending command: 0xD7 0x00 0x00 0x00 0x0002
       [SPI] Device status = 0xBE
dm9003 found

Ver: 0x00000001 SN: 0x00000129 MAC: 0x00.0x1E.0x5F.0x05.0xF4.0x7D
 MFR: KwikByte_DS_www.kwikbyte.com:rev1

>x Local buffer available of size: 4194304 bytes (4MB) at address: 0x210103F5

 Last x-modem transfer: FAIL (or not initiated)

>x 21020000CCCCCCCCCCCCCCCC
>x Local buffer available of size: 4194304 bytes (4MB) at address: 0x210103F5

 Last x-modem transfer: PASS size: 0x00230400 at address: 0x21020000

>

Connected 0:18:19     Auto detect     115200 8-N-1     SCROLL    CAPS    NUM    Capture    Print echo
```

26) From this example, the transfer size is 0x230400. Let's program flash with a command of the format "spi_write <flash destination> <source address> <size>". In this case,

spi_write 42000 21020000 230400 Enter

You should see lots of "[SPI]" messages scrolling during the programming operation. This command also takes a *long* time – depending on image size. Of course, there are faster ways to do this but let's start with this method. When the program operation is complete, the Driver Station reports "Buffer Written".

The re-image is complete. Reset the Driver Station by entering the command reset Enter.

3 Revisions

22DEC2008   Creation

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