

## Using a Serial Cable with the Z8102AX

The V1 model of the Z8102AX does not have a Recovery GUI so the only way to recover from a brick is to use a Serial cable.

The Serial cable can also be used to change the router's bootloader from V1 with no Recovery GUI to V2 which has this GUI.

### Prerequisites

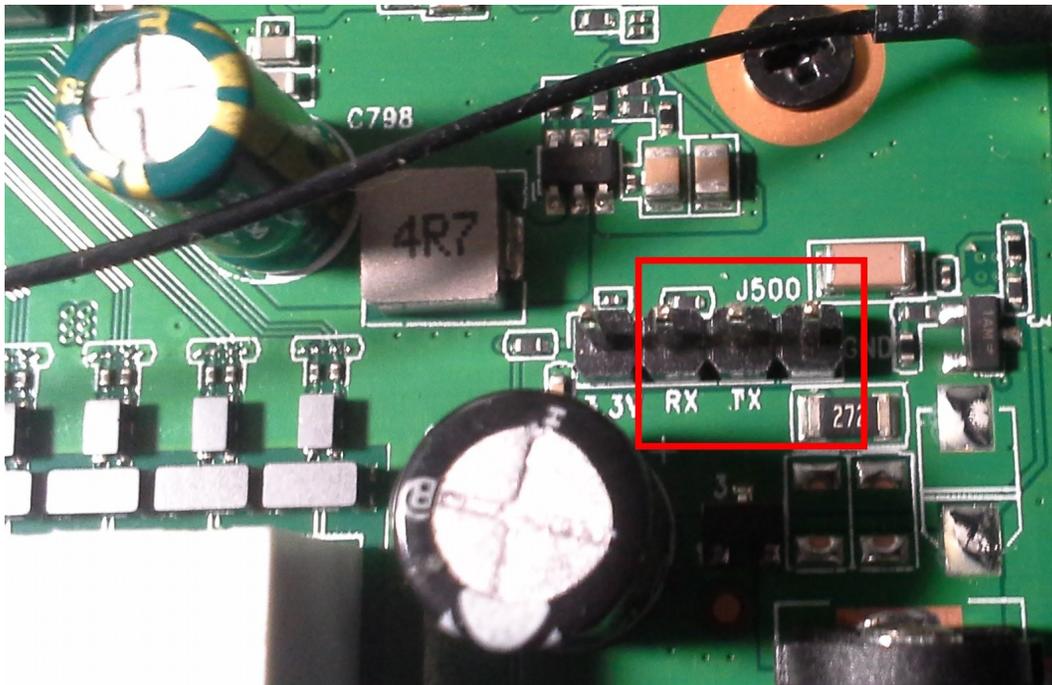
Some hardware and some software is need in order to do a Serial cable flash of the router.

You will need a PL2303 TTL serial adapter like this. Search Amazon for *PL2303 ttl* to find one.



to connect the router to your computer via a USB port. Only the black, white and green wires are used. **Never use the red wire as this can destroy your adapter or your router.**

You have to open the router case to access the serial interface on the board. You are looking for a set of pins that look like this.



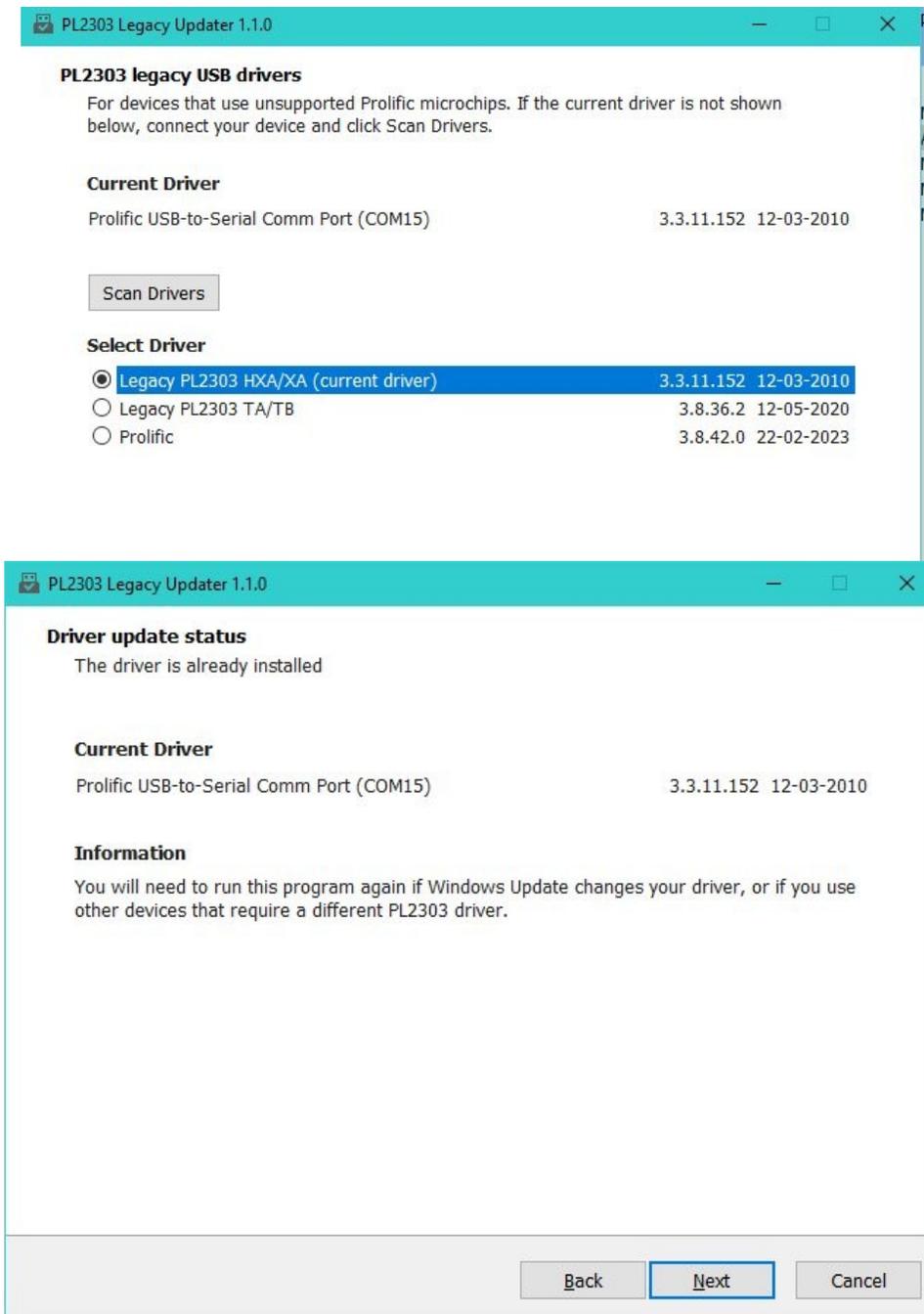
The pins should be marked GND, RX and TX. The other pins can be ignored. GND may not be marked but it is always on the end of the row of pins. The serial adapter connects the black wire to the GND, the white wire to TX and the green wire to RX. This is accomplished by slipping the wires over the proper pin.

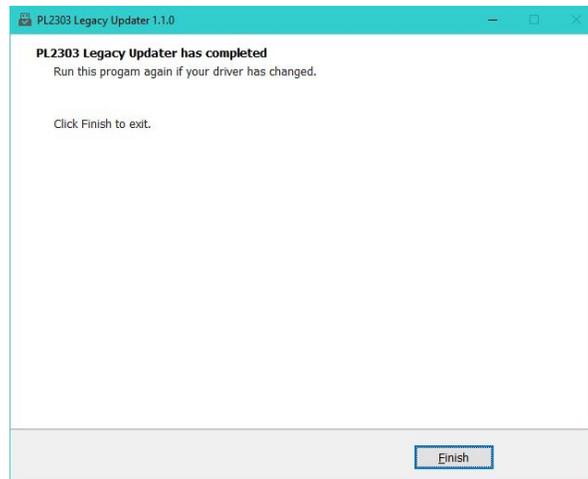
Once you have the Serial adapter connected to the router you need to install the necessary software. First up is the software that installs the drivers for the adapter.

Windows does not have a driver that works with most of the older Serial adapters, especially if they use cloned PL2303 chips rather than official ones. However, there is a program available that will install a driver that will work with most any Serial adapter. This is not needed with newer Serial adapters.

The program included in this package, *PL2303LegacyUpdaterSetup-1.1.0.exe*, will install a setup program that you then run to install the adapter driver. This may have to be done each time you use the adapter. Windows seems to replace the driver for no good reason at times. You will know you need to run the install program when you can't open the USB port of the adapter from the Terminal program.

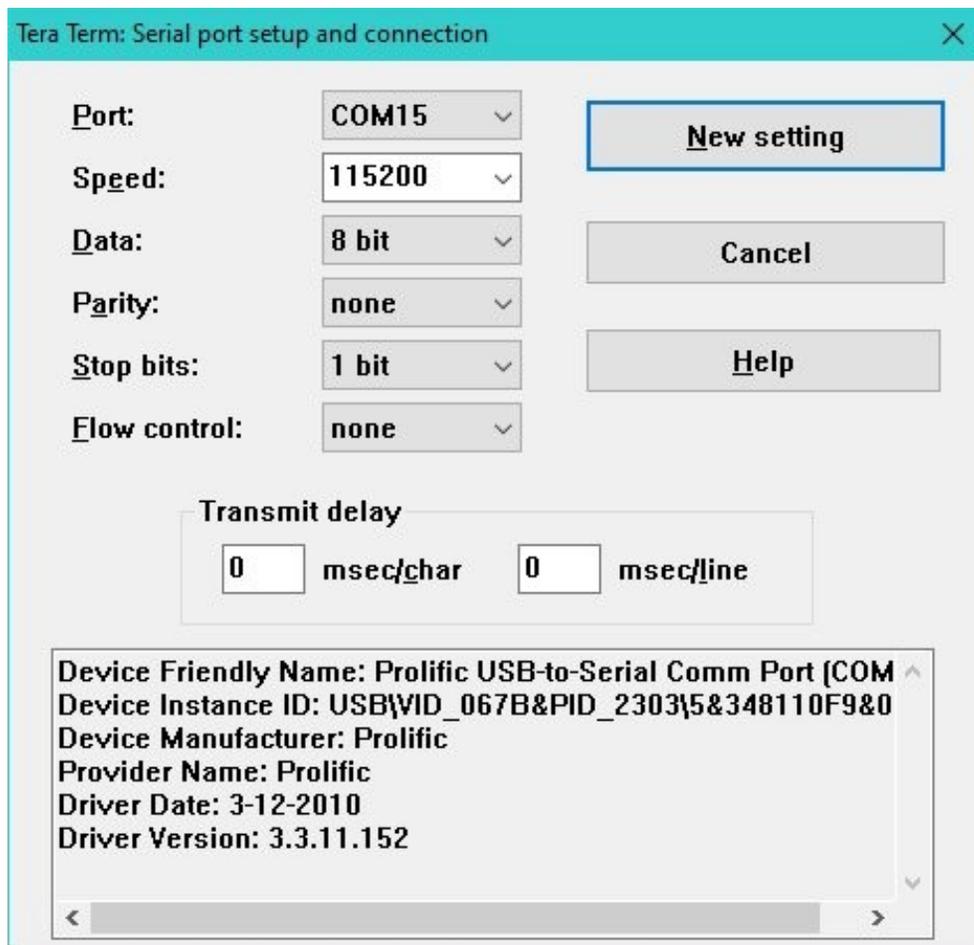
Plug in the adapter to a USB port on your computer and run the install program. The router should be powered off at this time. This can be found at <C:/Program Files/PL2303 Legacy Updater/PL2303LegacyUpdater.exe>.





Next, install the Terminal program, *teraterm-5.0-alpha.exe*. Once it is installed you are ready to use the Serial adapter on the router. The router must be powered off at this time and the adapter plugged into a USB port.

Run the *TetraTerm* program and setup the serial port to be used. Go to the *Setup* menu and the *Serial Port* submenu.

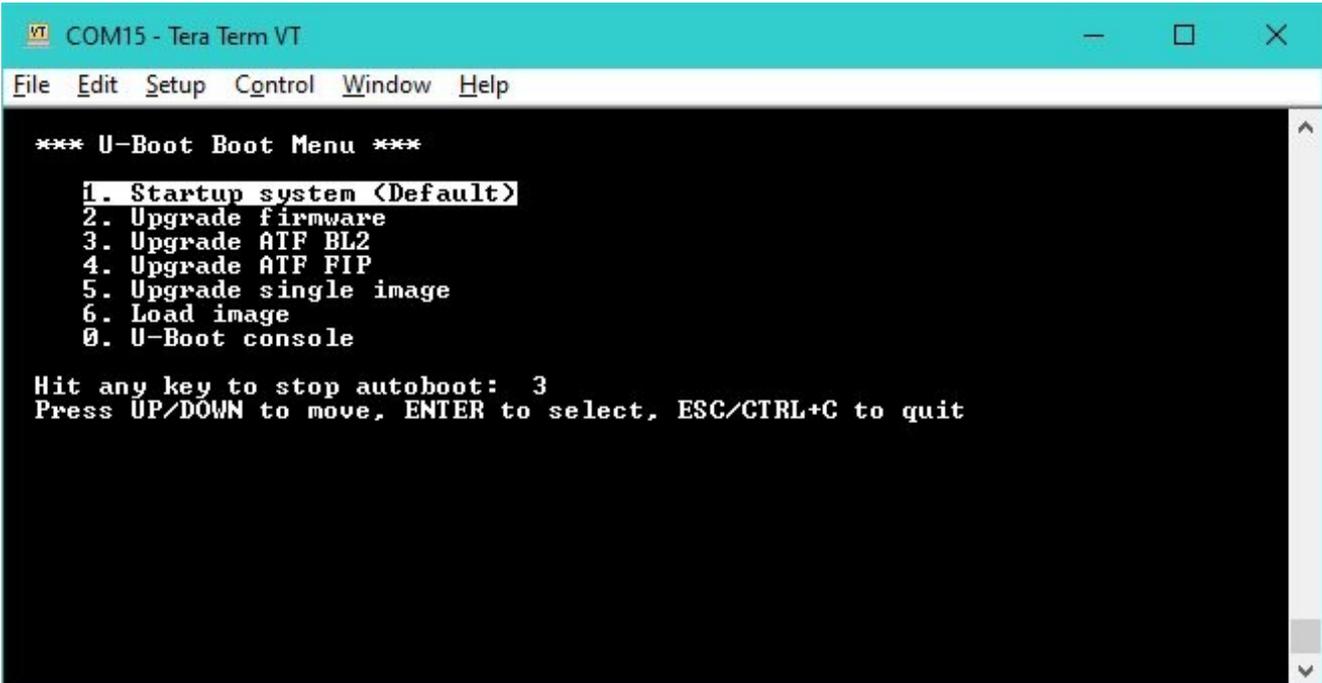


The Port is usually the highest COM port in the drop down list. The speed is normally 115200. Click *New Setting* to set these values for the current session. To make these your default settings go to the *Setup* menu and the *Save Settings* submenu.

**You may find that you need to close the Terminal and unplug the Serial adapter to completely power down the router. Then plug it in again and run the Terminal.**

You are now ready to check if everything works. Plug in the router and you should see something in the Terminal. If you see nothing then the green and white wires may need to be swapped. If you see gibberish then the Speed may have to be changed in the *Serial Port* menu.

There may be a bunch of unreadable text at the start but a boot menu will eventually appear. Unplug the router at this point so you can see what it says.

A screenshot of a terminal window titled "COM15 - Tera Term VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The terminal content shows a U-Boot Boot Menu with the following options: "1. Startup system (Default)", "2. Upgrade firmware", "3. Upgrade ATF BL2", "4. Upgrade ATF FIP", "5. Upgrade single image", "6. Load image", and "0. U-Boot console". Below the menu, it says "Hit any key to stop autoboot: 3" and "Press UP/DOWN to move, ENTER to select, ESC/CTRL+C to quit".

```
VT COM15 - Tera Term VT
File Edit Setup Control Window Help
*** U-Boot Boot Menu ***
1. Startup system (Default)
2. Upgrade firmware
3. Upgrade ATF BL2
4. Upgrade ATF FIP
5. Upgrade single image
6. Load image
0. U-Boot console

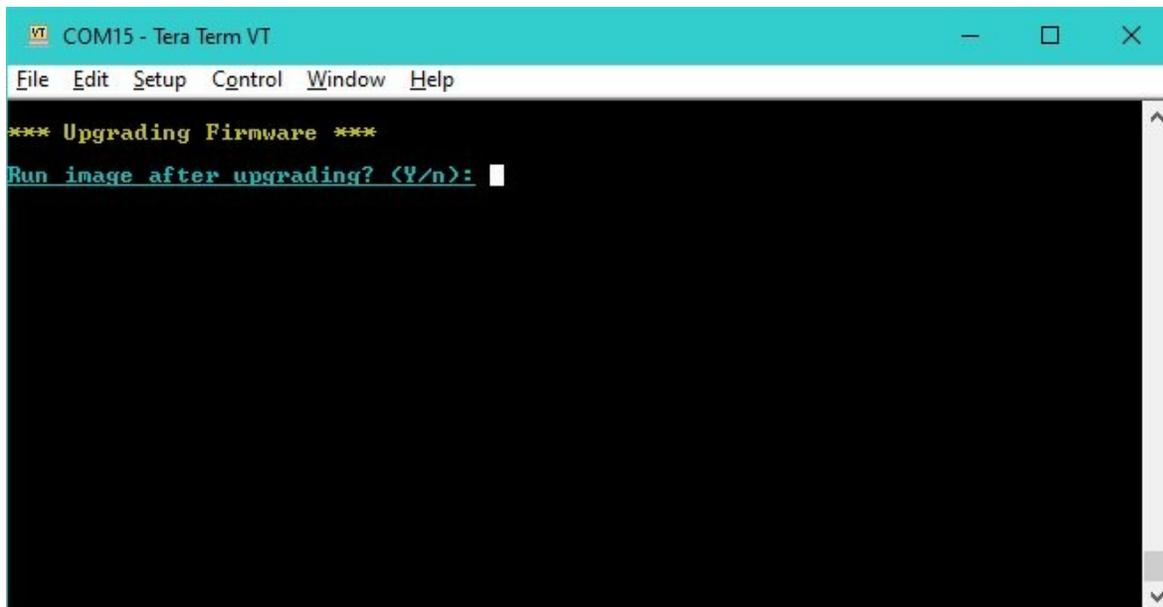
Hit any key to stop autoboot: 3
Press UP/DOWN to move, ENTER to select, ESC/CTRL+C to quit
```

There are variations on this menu as different bootloaders have different designs. What you are looking for is a menu that is for upgrading the firmware. This example is for the ZBT Z8102AX V1.

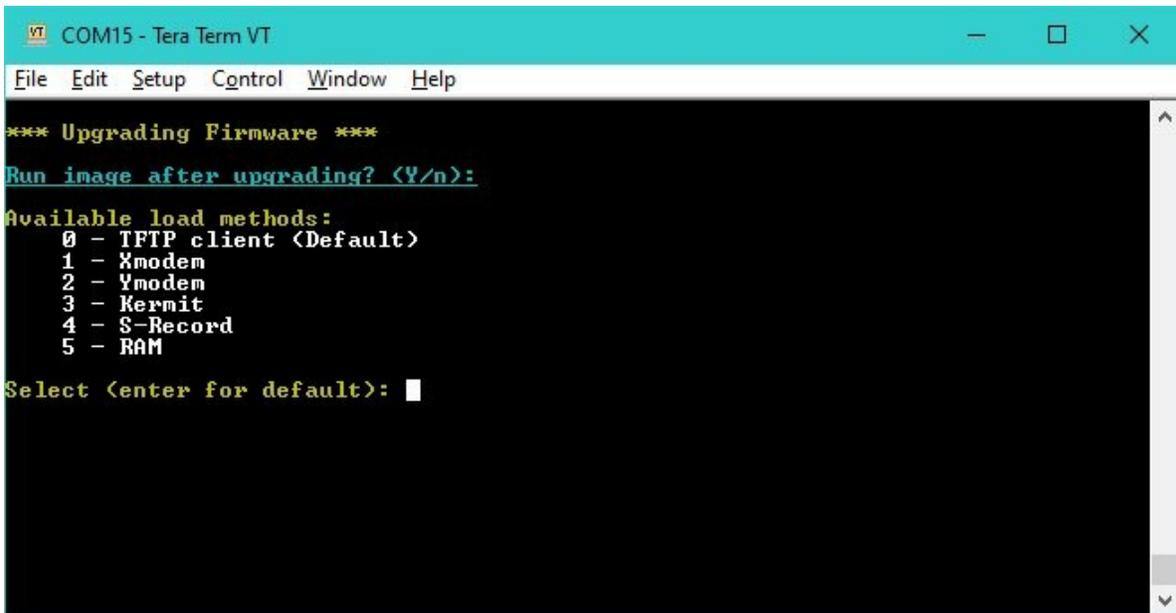
In this case it is menu 2. When this menu appears press the '2' key on the keyboard to interrupt the boot process and have it enter TFTP flash mode. You usually have 3 seconds to do this in. Make sure the Terminal has the focus by first clicking on the console area.

Now that we know the menu we want for flashing the firmware, plug in the router once again and press 2 at the correct time. You may have to repeat this several times to interrupt the bootloader.

Once you have interrupted the bootloader and enter the Upgrade Firmware menu you have to determine what IP addresses and file name the router expects when using TFTP to upload and flash the firmware. Follow the steps that appear in the Terminal.

A screenshot of a terminal window titled "COM15 - Tera Term VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The terminal output shows the text "\*\*\* Upgrading Firmware \*\*\*" in yellow. Below that, the prompt "Run image after upgrading? (Y/n):" is displayed in cyan, followed by a white cursor. The rest of the terminal area is black.

Press *Enter* to allow rebooting the router after flashing.



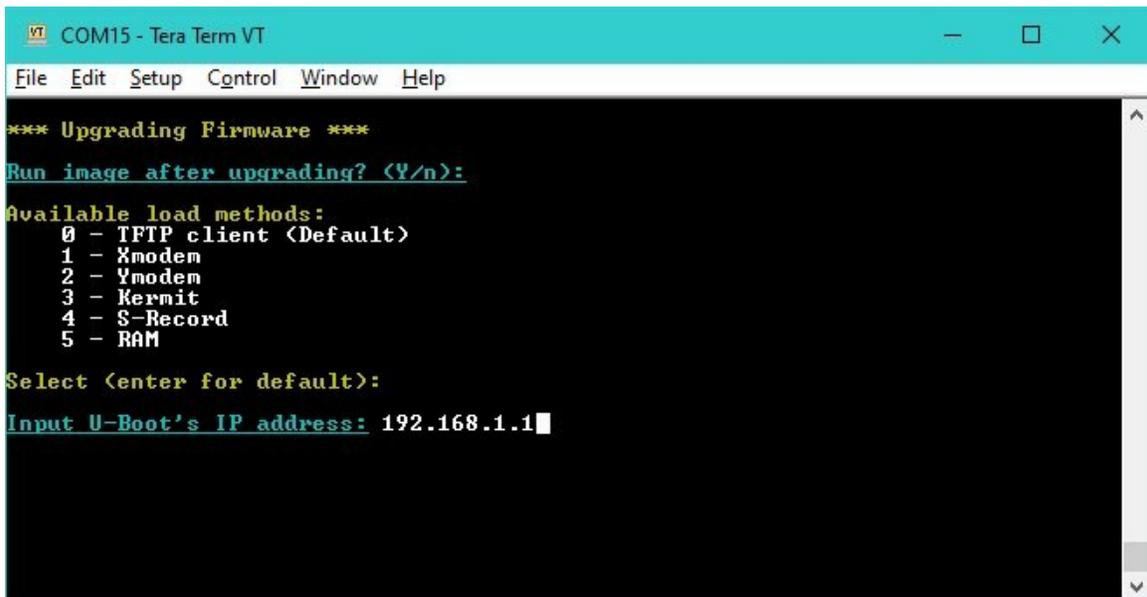
```
VT COM15 - Tera Term VT
File Edit Setup Control Window Help

*** Upgrading Firmware ***
Run image after upgrading? <Y/n>:

Available load methods:
0 - TFTP client <Default>
1 - Xmodem
2 - Ymodem
3 - Kermit
4 - S-Record
5 - RAM

Select <enter for default>: █
```

Press *Enter* to chose TFTP as the method of uploading the firmware.



```
VT COM15 - Tera Term VT
File Edit Setup Control Window Help

*** Upgrading Firmware ***
Run image after upgrading? <Y/n>:

Available load methods:
0 - TFTP client <Default>
1 - Xmodem
2 - Ymodem
3 - Kermit
4 - S-Record
5 - RAM

Select <enter for default>:
Input U-Boot's IP address: 192.168.1.1█
```

Press *Enter* to define the router's IP address as 192.168.1.1. This is probably the best address to use. You may find that attempting to change any of the values in this menu will not work as Backspace can be a bit flaky with some older cloned adapters. New ones seem to work fine.

```
COM15 - Tera Term VT
File Edit Setup Control Window Help

*** Upgrading Firmware ***
Run image after upgrading? <Y/n>:

Available load methods:
0 - TFTP client (Default)
1 - Xmodem
2 - Ymodem
3 - Kermit
4 - S-Record
5 - RAM

Select <enter for default>:
Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.10
```

This is the IP address of the computer used to upload the new firmware. You will have to set the computer to have this IP as a Static address.

```
COM15 - Tera Term VT
File Edit Setup Control Window Help

*** Upgrading Firmware ***
Run image after upgrading? <Y/n>:

Available load methods:
0 - TFTP client (Default)
1 - Xmodem
2 - Ymodem
3 - Kermit
4 - S-Record
5 - RAM

Select <enter for default>:
Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.10
Input IP netmask: 255.255.255.0
```

Press *Enter* to accept this Netmask.

```
COM15 - Tera Term VT
File Edit Setup Control Window Help

*** Upgrading Firmware ***
Run image after upgrading? (Y/n):
Available load methods:
 0 - TFTP client (Default)
 1 - Xmodem
 2 - Ymodem
 3 - Kermit
 4 - S-Record
 5 - RAM
Select (enter for default):
Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.10
Input IP netmask: 255.255.255.0
Input file name: Z8102AX-nand-mt7981-DDR4-23.0711_101616.bin
```

This is the name of the firmware you wish to flash. You may need to rename the firmware to match this if you are unable to change the name.

At any point you can unplug the router and stop the flashing process without problems and start all over again.

Now that we have the needed information to use TFTP to upload the firmware, unplug the router so we can set up the TFTP server on the computer. The information we have about this is

- Router IP address – 192.168.1.1
- Computer IP address – 192.168.1.10
- Netmask – 255.255.255.0
- Firmware name – Z8102AX-nand-mt7981-DDR4-23.0711\_101616.bin

Included in this package is the *tftpd32* TFTP server program. This will be used to upload the firmware to the router. The above information needs to be supplied to *tftpd32* so it will work with the router. This is done by editing the *tftpd32.ini* file with a text editor.

```
1  [DHCP]
2  Lease_NumLeases=0
3  IP_Pool=192.168.1.1
4  PoolSize=1
5  BootFile=Z8102AX-nand-mt7981-DDR4-23.0711_101616.bin
6  DNS=
7  DNS2=
8  WINS=
9  Mask=255.255.255.0
10 Gateway=192.168.1.1
11 Option42=
```

```
50 MD5=0
51 LocalIP=192.168.1.10
52 Services=15
53 TftpLogFile=
54 SaveSyslogFile=
55 PipeSyslogMsg=0
56 LowestUDPPort=0
57 HighestUDPPort=0
58 MulticastPort=0
59 MulticastAddress=
60 PersistantLeases=0
61 DHCP Ping=0
62 DHCP LocalIP=192.168.1.10
```

Change the *IP\_Pool* and the *Gateway* to the router's IP address , make sure the *Mask* is the same as the Netmask and change *LocalIP* and *DHCP LocalIP* to the computer's IP address.

Save the file.

Copy the firmware you wish to flash into the folder that contains *tftpd32* and rename it to match the expected firmware name.

The computer must now be given a Static IP address that matches what the router expects. Set your computer to have a static IP address by going to *Network and Internet Settings* and *Change Adapter Options*. Select the *Local*

*Area Connection* and then the *Properties* button. Next select the *Properties* for the Internet Protocol 4 entry. Change the data there to the following.

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

Obtain an IP address automatically

Use the following IP address:

IP address: 192 . 168 . 1 . 10

Subnet mask: 255 . 255 . 255 . 0

Default gateway: 192 . 168 . 1 . 4

Obtain DNS server address automatically

Use the following DNS server addresses:

Preferred DNS server: 8 . 8 . 8 . 8

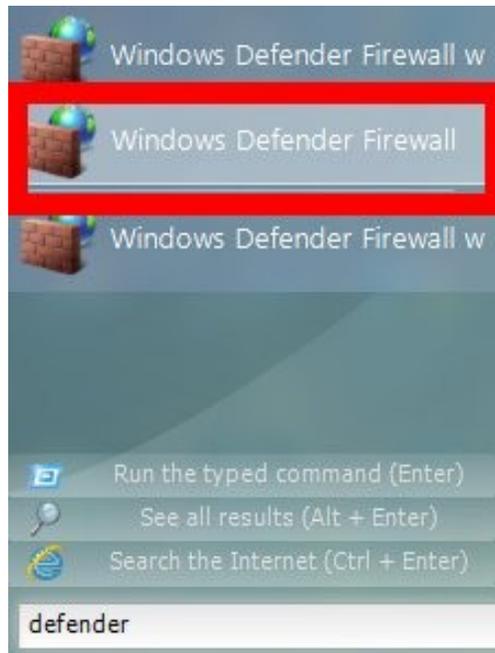
Alternate DNS server: . . .

Validate settings upon exit

Advanced...

OK Cancel

And lastly, before we attempt to flash the router, we must turn off the computer's Firewall. Go to the *Start* menu and search for *Defender*.



You will the have this pop up.



Go to the menu to turn off the Firewall.

## Customize settings for each type of network

You can modify the firewall settings for each type of network that you use.

### Private network settings



Turn on Windows Defender Firewall

Block all incoming connections, including those in the list of allowed apps

Notify me when Windows Defender Firewall blocks a new app



Turn off Windows Defender Firewall (not recommended)

### Public network settings



Turn on Windows Defender Firewall

Block all incoming connections, including those in the list of allowed apps

Notify me when Windows Defender Firewall blocks a new app



Turn off Windows Defender Firewall (not recommended)

Click on *OK*. Remember that after you have finished flashing the router to turn the Firewall back on.

We are now ready to flash the router. Run *tftpd32.exe* to start the TFTP server. **Make sure the Ethernet cable from the computer is plugged into a LAN port on the router.**

Power up the router, interrupt the boot process and repeat the steps to set up for a flash via TFTP. Pressing *Enter* after the firmware name is entered will start the process. You will see something like this.

```
COM15 - Tera Term VT
File Edit Setup Control Window Help
*** Upgrading Firmware ***
Run image after upgrading? (Y/n):
Available load methods:
0 - TFTP client (Default)
1 - Xmodem
2 - Ymodem
3 - Kermit
4 - S-Record
5 - RAM
Select (enter for default):
Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.10
Input IP netmask: 255.255.255.0
Input file name: Z8102AX-nand-mt7981-DDR4-23.0711_101616.bin
Using ethernet@15100000 device
TFTP from server 192.168.1.10; our IP address is 192.168.1.1
Filename 'Z8102AX-nand-mt7981-DDR4-23.0711_101616.bin'.
Load address: 0x46000000
Loading: █
```

*Tftpd32* will show the file being uploaded to the router and the Terminal will show the progress as well. After the router has been flashed it will reboot and come up normally. You can see this on the Terminal.

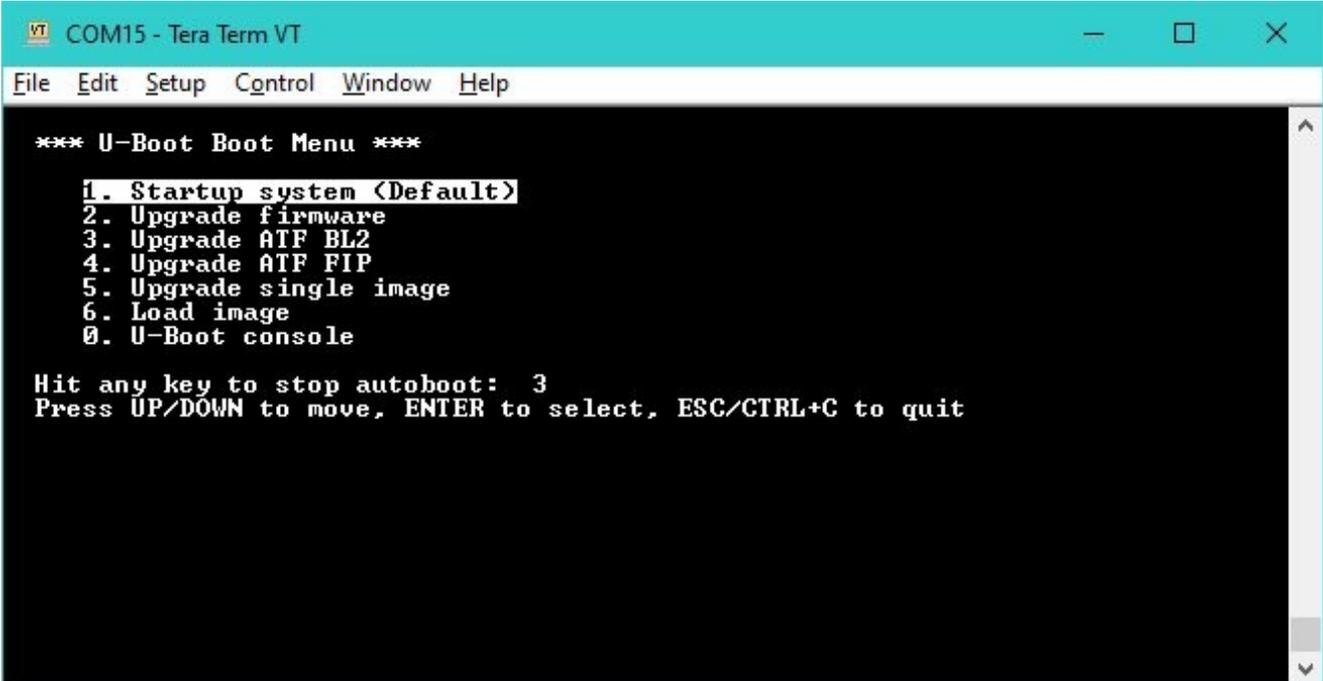
Once this has happened you can exit *tftpd32* and turn the Firewall back on. The Serial cable recovery process is complete.

## Changing the V1 Bootloader to V2

It is possible to change the bootloader on the V1 model to the V2 bootloader so you have a Recovery GUI. This will also necessitate flashing the router to the V2 firmware.

You can also change the V2 bootloader to V1 to use other firmware that doesn't run on the V2.

Like flashing the firmware you need to setup the Terminal so you can interrupt the bootloader at it's menu.



```
VT COM15 - Tera Term VT
File Edit Setup Control Window Help
*** U-Boot Boot Menu ***
 1. Startup system (Default)
 2. Upgrade firmware
 3. Upgrade ATF BL2
 4. Upgrade ATF FIP
 5. Upgrade single image
 6. Load image
 0. U-Boot console

Hit any key to stop autoboot: 3
Press UP/DOWN to move, ENTER to select, ESC/CTRL+C to quit
```

Press 4 at this point to upgrade the FIP partition. This will be done using TFTP just like the firmware.

Before you attempt to flash you must set up the TFTP server just as you did for flashing a firmware. The only difference is you change the BootFile to *fip.bin* in *tftpd32.ini*

```
[DHCP]
Lease NumLeases=0
IP_Pool=192.168.1.1
PoolSize=1
BootFile=fip.bin
DNS=
DNS2=
WINS=
```

The whole FIP flash should look like this.

```
*** Upgrading ATF FIP ***
Available load methods:
 0 - TFTP client (Default)
 1 - Xmodem
 2 - Ymodem
 3 - Kermit
 4 - S-Record

select (enter for default): 0

Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.10
Input IP netmask: 255.255.255.0
Input file name: fip.bin

Using ethernet@15100000 device
TFTP from server 192.168.1.10; our IP address is 192.168.1.1
Filename 'fip.bin'.
Load address: 0x46000000
Loading: #####T #####
          55.7 KiB/s
done
Bytes transferred = 774593 (bd1c1 hex)
Saving Environment to MTD... Erasing on MTD device 'nmbm0'... OK
Writing to MTD device 'nmbm0'... OK
OK

*** Loaded 774593 (0xbd1c1) bytes at 0x46000000 ***

Erasing 'fip' from 0x380000, size 0xc0000 ... OK
Writing 'fip' from 0x46000000 to 0x380000, size 0xbd1c1 ... OK

*** ATF FIP upgrade completed! ***

MT7981>
```

Unplug the router and once again interrupt the bootloader at it's menu by pressing 3 this time.

Change the BootFile to *bl2.img* in *tftpd32.ini*

```
[DHCP]
Lease_NumLeases=0
IP_Pool=192.168.1.1
PoolSize=1
BootFile=bl2.img
DNS=
DNS2=
WTNS=
```

and start the TFTP server once again. The flashing should look like this.

```
*** Upgrading ATF BL2 ***
Available load methods:
 0 - TFTP client (Default)
 1 - Xmodem
 2 - Ymodem
 3 - Kermit
 4 - S-Record
select (enter for default): 0
Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.10
Input IP netmask: 255.255.255.0
Input file name: bl2.img
Using ethernet@15100000 device
TFTP from server 192.168.1.10; our IP address is 192.168.1.1
Filename 'bl2.img'.
Load address: 0x46000000
Loading: #####
          2 MiB/s
done
Bytes transferred = 238292 (3a2d4 hex)
Saving Environment to MTD... Erasing on MTD device 'nmbm0'... OK
Writing to MTD device 'nmbm0'... OK
OK
*** Loaded 238292 (0x3a2d4) bytes at 0x46000000 ***
Erasing 'bl2' from 0x0, size 0x40000 ... OK
writing 'bl2' from 0x46000000 to 0x0, size 0x3a2d4 ... OK
*** ATF BL2 upgrade completed! ***
MT7981>
```

At this point you are at the bootloader command line where you have to enter two commands. This is critical as without them the bootloader will not have a working Recovery GUI.

**env default -f -a**

**saveenv**

You can now either restart the router and use the Serial cable to flash the V2 firmware or you can use the bootloader Recovery GUI to flash it. The existing V1 firmware will not work at this point so you have to use one of these two methods to flash the V2 firmware.

## **Changing the V2 Bootloader to V1**

If you desire to switch the V2 bootloader to the V1 version it is done the exact same way. This would be done if you wish to use a firmware that doesn't work on the V2.

The only difference in the procedure is to change *fip.bin* to *fip-1.bin* and *bl2.img* to *bl2-1.img*.

You have to flash to the V1 firmware using the Serial cable as there is now no Recovery GUI and the V2 firmware will not work with the V1 bootloader.