How to Flash Firmware in the Turnigy/FlySky/Eurgle/IMAX 9x Transmitter

This guide is intended as a cookbook solution to flashing new or alternate firmware to the various labeled brands of the OEM FlySky 9x. One way to do it is presented, which works well. Alternatives are generally not shown to prevent confusion. If you follow these steps exactly, you should have good luck. If you do something else, this guide will be of only general help. Everything on the list is available from US suppliers, except as noted. I don't know about shipping to other countries.

Disclaimer

While I believe the instructions in this document are accurate, I make no guarantee that you will be successful, and won't turn your 9x into a door stop. Anything you do to your 9x based on this document is entirely at your own risk. The 9x and it's processor are tough but not indestructible. You've been warned!!

WARNING: If you have never soldered before, and particularly if you have never soldered on a printed circuit board before, now is not a good time to start!! Have someone experienced do the soldering on the mainboard of your 9x.

Requirements

You will need the following:

Turnigy/FlySky/Eurgle/IMAX 9x Transmitter

Windows based computer with Windows XP or higher and one free USB port

AVR Pocket Programmer, available here: https://www.sparkfun.com/commerce/product_info.php?products_id=9825

[NOTE: I've also been told that these programmers also work well. They have different drivers available on their websites, and will require different settings in BURN-O-MAT. I have NO experience with them.

Available for worldwide shipping from Australia:

http://www.protostack.com/index.php?main_page=product_info&cPath=23&products_id=24&sid=622795031541c9101e40eba47b9f5d69

Available in Europe:

http://shop.myavr.com/index.php?sp=article.sp.php&artID=200006]

AVR Pocket Programmer Windows driver, available here:
http://www.sparkfun.com/datasheets/Programmers/pocketprog-driver.zip

USB cable like this: http://www.monoprice.com/products/product.asp?c_id=103&cp_id=10303&cs_id=1030302&p_id=3896&seq=1&format=2

15 watt (NOTHING HIGHER!!!) pencil soldering iron like this:
http://www.radioshack.com/search/index.jsp?kwCatId=&kw=15%20watt%20soldering%20iron&origkw=15%20watt%20soldering%20iron&sr=1

Rosin core solder

WinAVR program: http://sourceforge.net/projects/winavr/files/WinAVR/20100110/WinAVR-20100110-install.exe/download

AVR Burn-O-MAT program: http://avr8-burn-o-mat.aaabbb.de/AVR8_Burn-O-Mat_2_1_2_setup.exe

If you don't already have the Java Runtime Environment (JRE) installed on your computer, you will also need this to run AVR Burn-O-Mat: https://cds.sun.com/is-bin/INTERSHOP.enfinity/WFS/CDS-CDS_Developer-Site/en_US/-/USD/ViewProductDetail-Start?ProductRef=jre-6u21-oth-JPR@CDS-CDS_Developer

This cable/connector combination: http://search.digikey.com/scripts/DkSearch/dksus.dll?lang=en&site=US&WT.z_homepage_link=hp_go_button&KeyWords=h1kxh-1036m-nd&x=17&y=25
This is a color coded flat cable/connector combination which makes it really easy to figure out which wire is which. They show as zero in stock, but they make them up custom and ship usually in one day.

Cable connector: http://search.digikey.com/scripts/DkSearch/dksus.dll?WT.z_header=search_go&lang=en&site=us&keywords=awp10-7241-t-r&x=0&y=0
This is used to cap the above cable when not in use.

Low temp hot glue gun and low temp glue gun sticks. I bought mine at Walmart.

Various small drills/files/phillips screwdriver. I also recommend head mounted magnifiers to make the soldering easier to see.

Note: If you are going to install this on a Vista /Windows 7 64 bit (x64) system, you also need to read the Appendix!

Hardware Installation

Plug in the 15 watt soldering iron and let it warm up for 15 minutes or so. Do NOT, under any circumstances, use any iron above 15 watts!! You can easily ruin the main board in your 9x if you do!!

Plug in the hot glue gun and let it warm up.

Remove the 6 phillips screws from the back of the transmitter case and retain them for reinstallation. There is no need to remove the transmitter module or battery pack first.

Carefully separate the case front from the back, noting the cable that connects the front and the back of the case. Carefully remove the connector on the cable from the transmitter back to the main printed circuit board (PCB) on the front half of the transmitter. Set the back of the case aside for now.
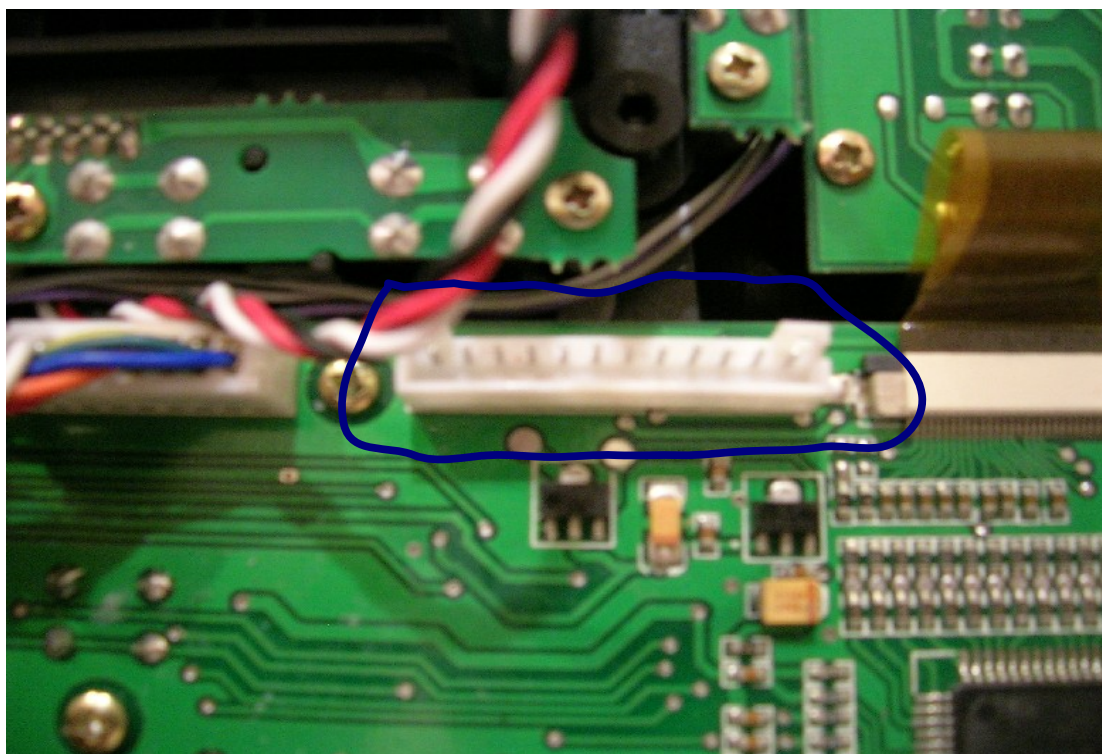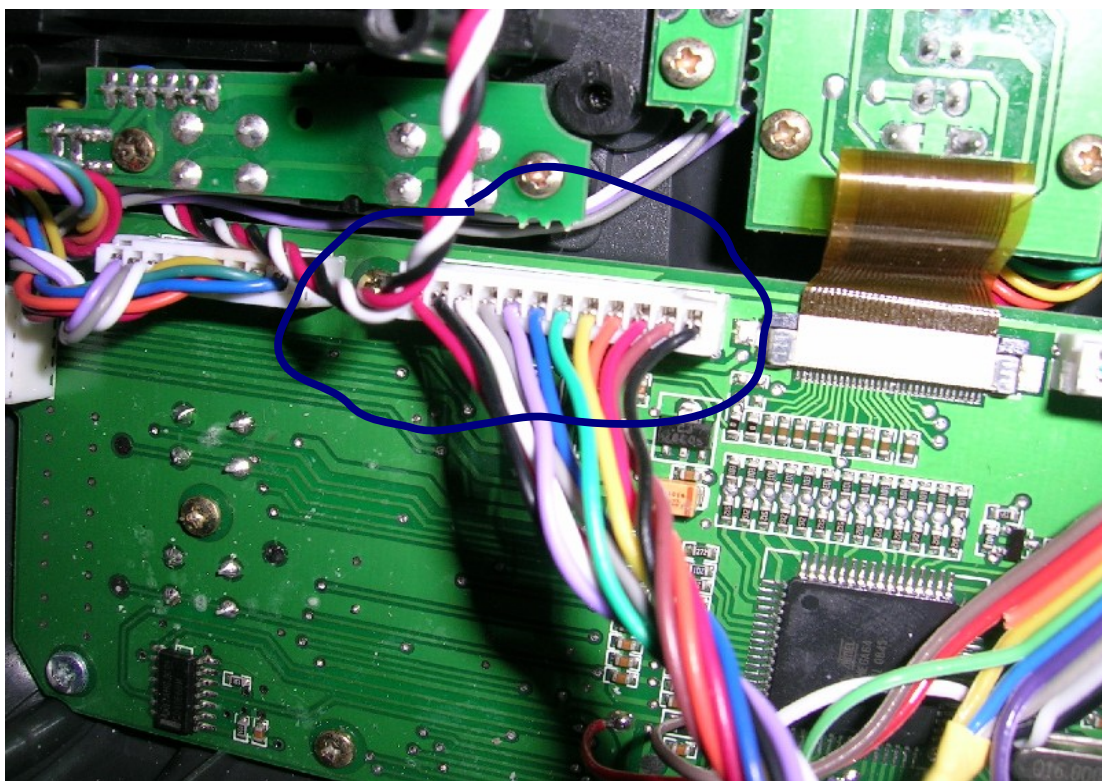
Take the color coded cable/connector combination you got from DigiKey. If you look VERY closely, you will see that there is a small arrow on one side of the connector. It SHOULD be on the end that the Brown wire is on.   Cut off all but about 4 to 5 inches (10 to 12.5 cm) of cable attached to the connector. Scissors work well to cut the cable.   Carefully separate the wires in the cable from each other, using your fingernails to separate them. Separate them back about 2 inches (5 cm) or so.
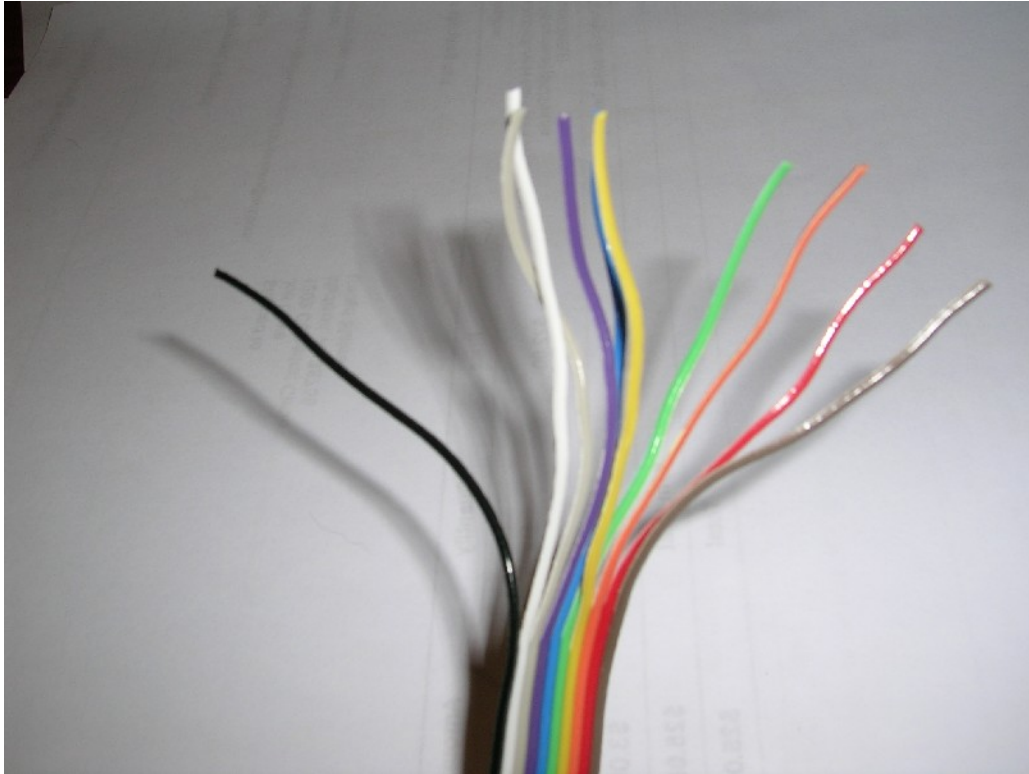
Cut the following separated wires back to the separation point. They are not required for hookup to the transmitter: Orange/Yellow/Blue/Grey. You should now have the following colors left: Brown/Red/Green/Purple/White/Black. These will be used to connect to the main PCB of the 9x.
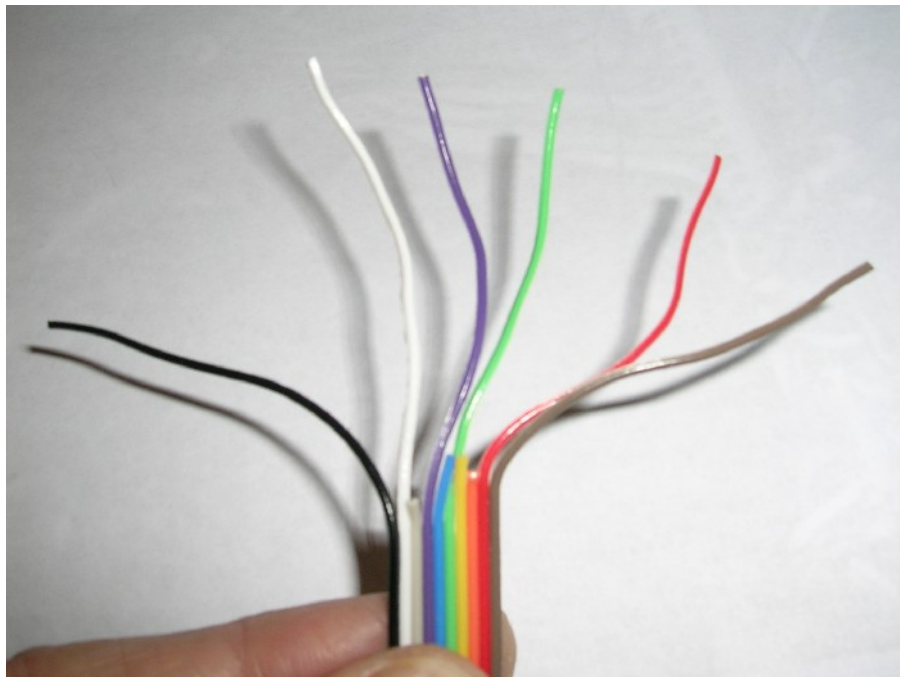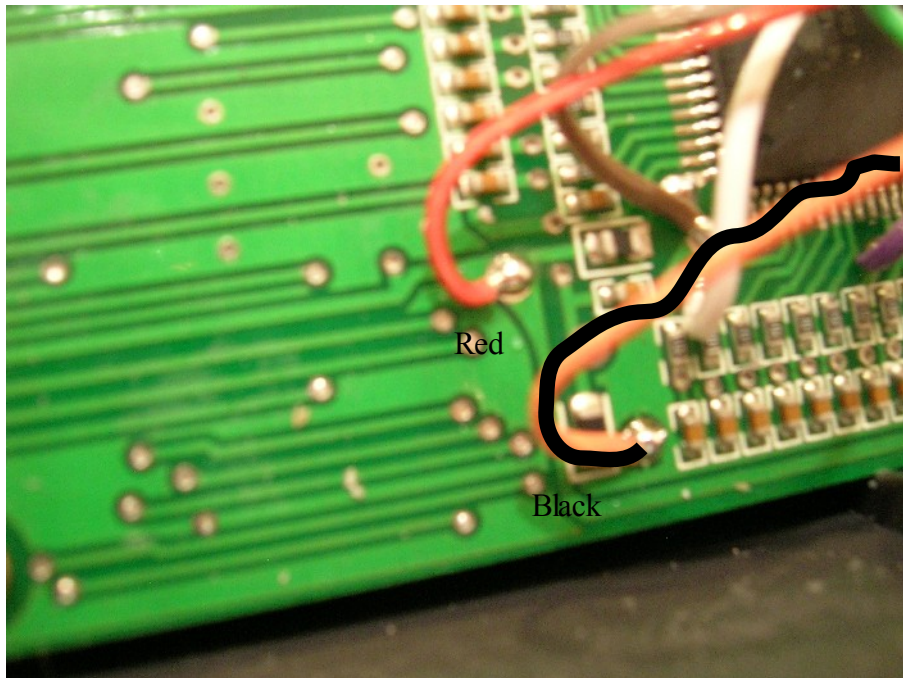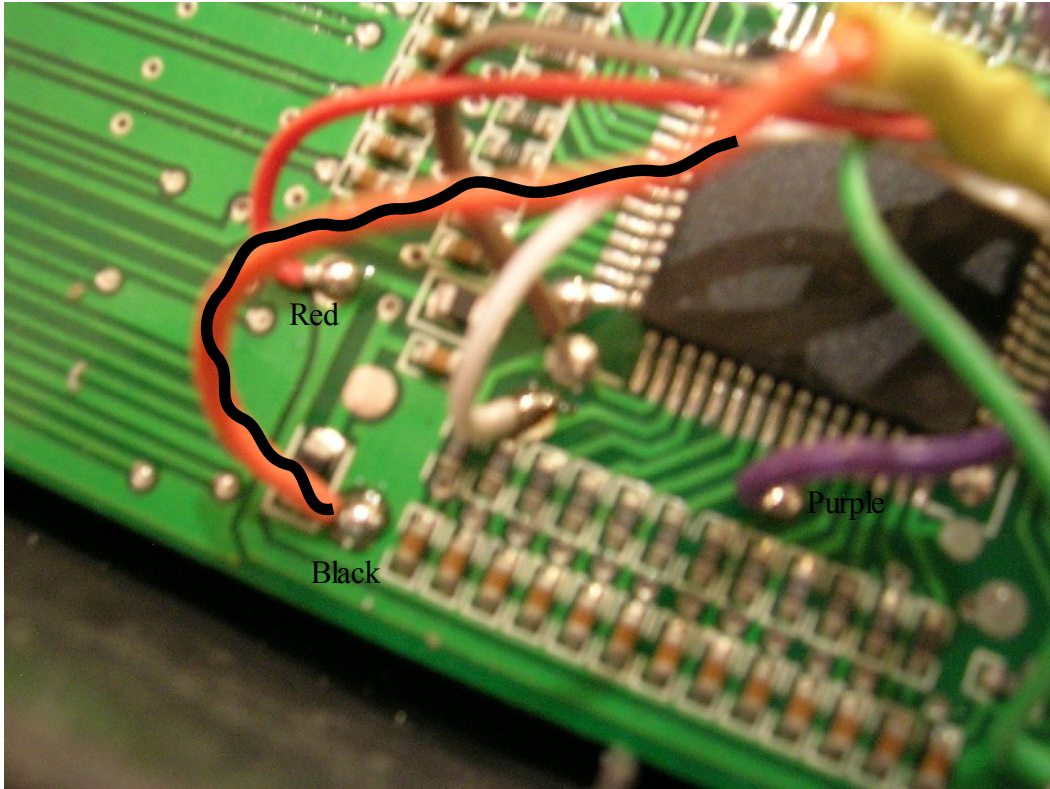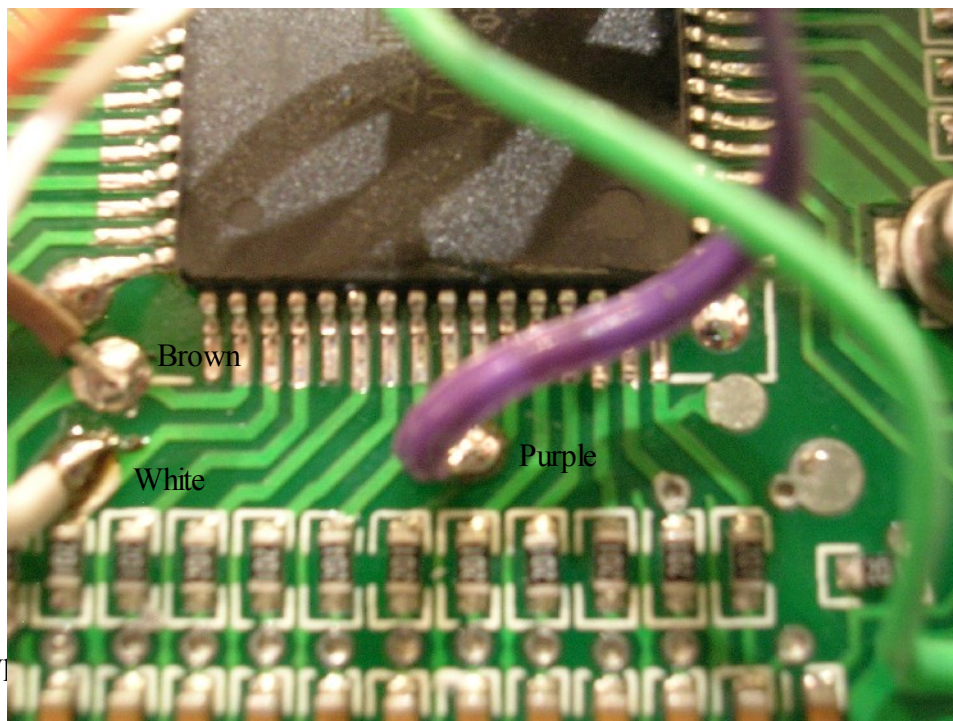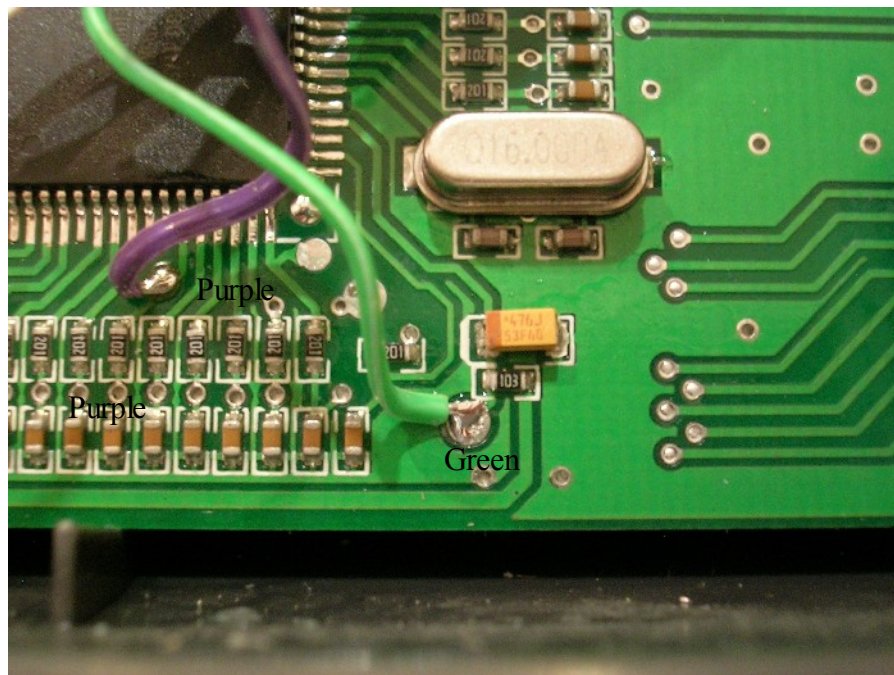
Carefully strip the insulation no more than 1/16" (1mm) from the end of each of the remaining wires, and tin the ends with solder.
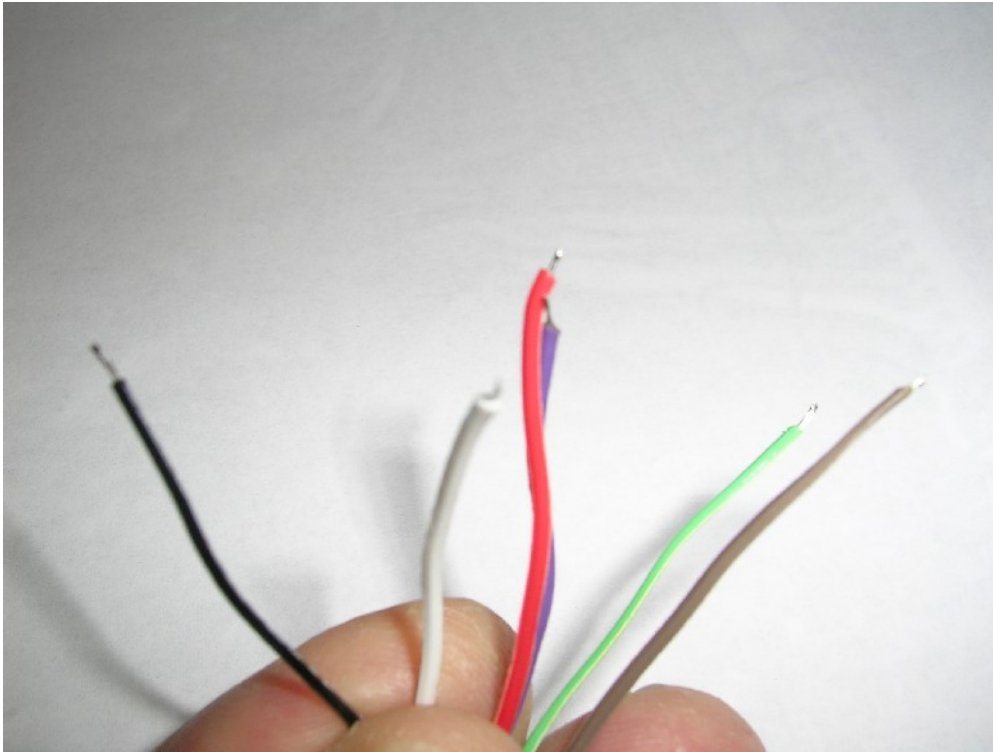
Look at the pictures below, and note where each of the colored wires will be soldered to the main PCB. Note that I colored in the black wire to show the correct color code.

Red

Black

Purple

Red

Black
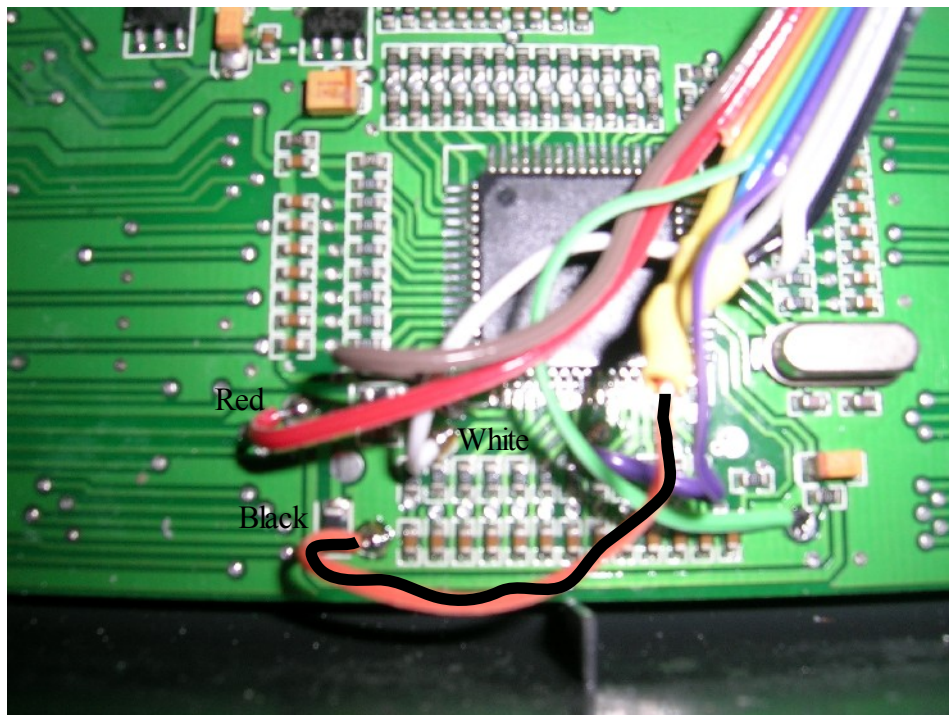
Note: There are two versions of the main PCB in the 9x. The later ones have a pad where the Purple wire will be connected. The early ones do not. If you have an early style board, you can still do the mod, you just have to be very careful with your soldering, as you will be soldering to the end of the

surface mount resistor shown. The early style is shown in the picture below. Note the blue circle. One the old style, you cannot use that pad. The CORRECT pad is connected to the 7th resistor from the left on the late style boards:
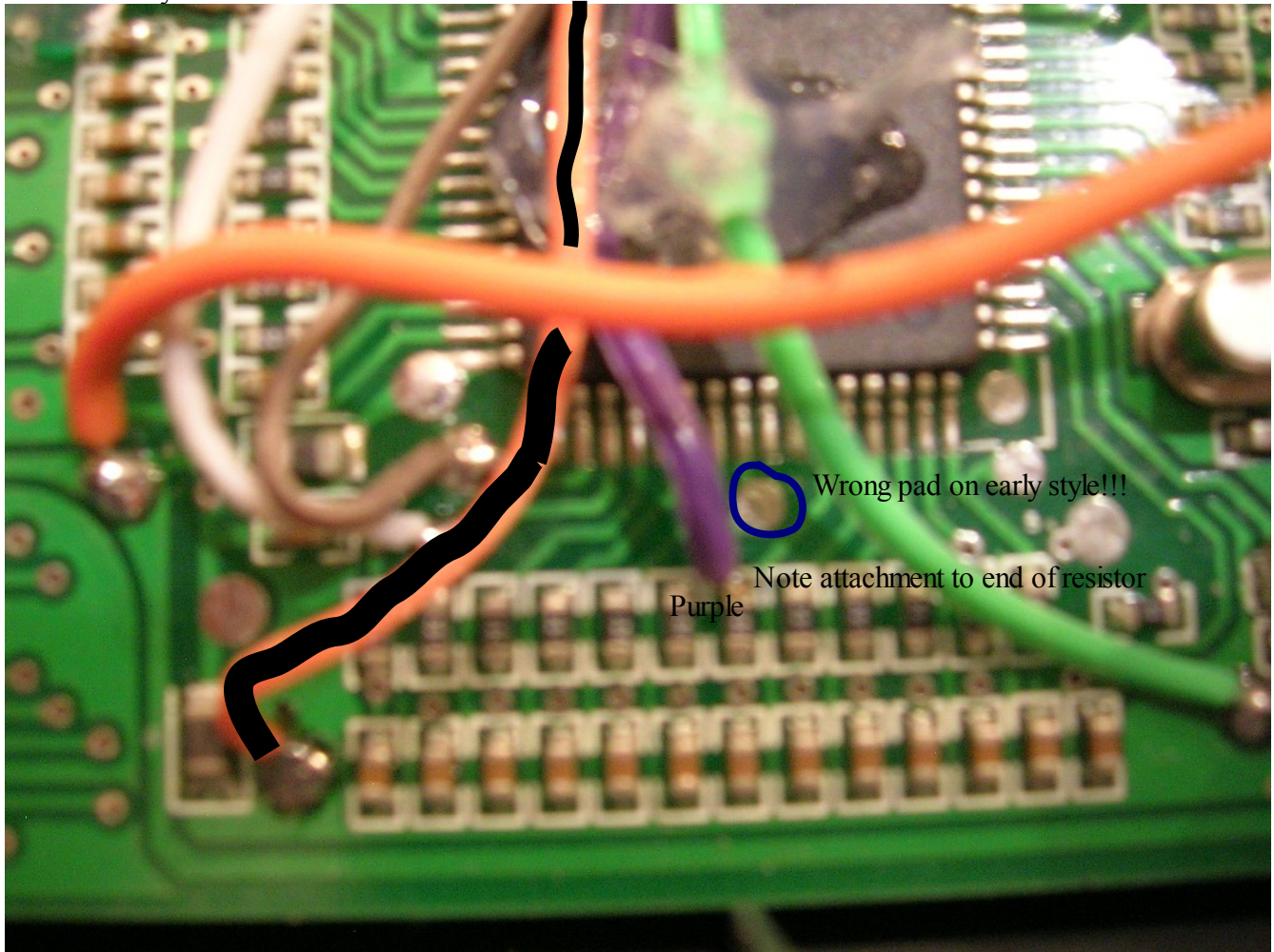

Carefully tin each of the round pads where the wires will attach to the PCB. Just a small amount of solder is necessary, but it helps to quickly solder the leads to the PCB. If you have an early board, you don't need to tin the connection at the resistor. Quickly solder each of the color coded wires to the indicated spot on the PCB. If you have an early 9x, just touch the very tip of the soldering iron to the end of the resistor and the Purple colored wire simultaneously, and remove the iron quickly.

Double check that you have soldered each wire to the correct location on the PCB. There are extra round pads that we don't use, so it is easy to make a mistake.

Gather the individual wires together in a bundle, and hot glue them to the top of the main processor. This acts as a strain relief on the solder joints.
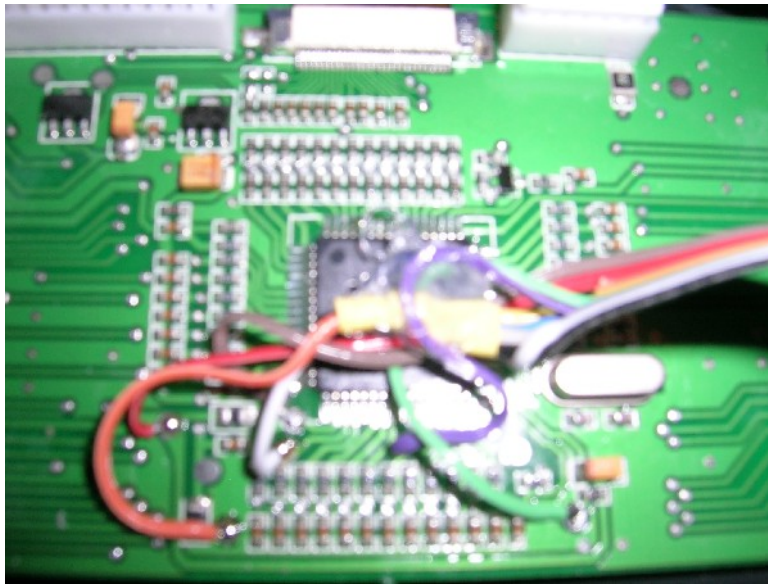
Note the position of the connector in the transmitter case on the pictures below.
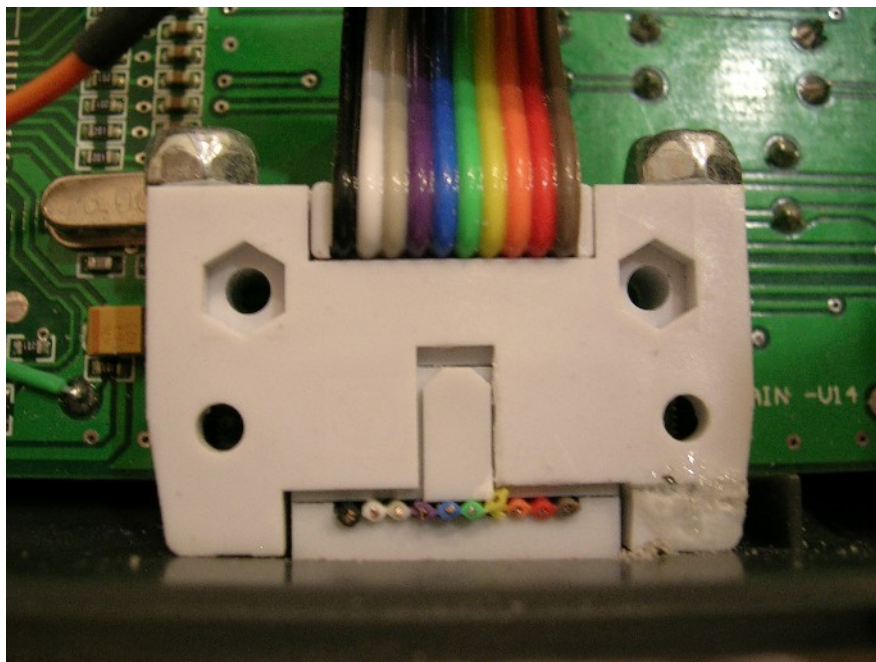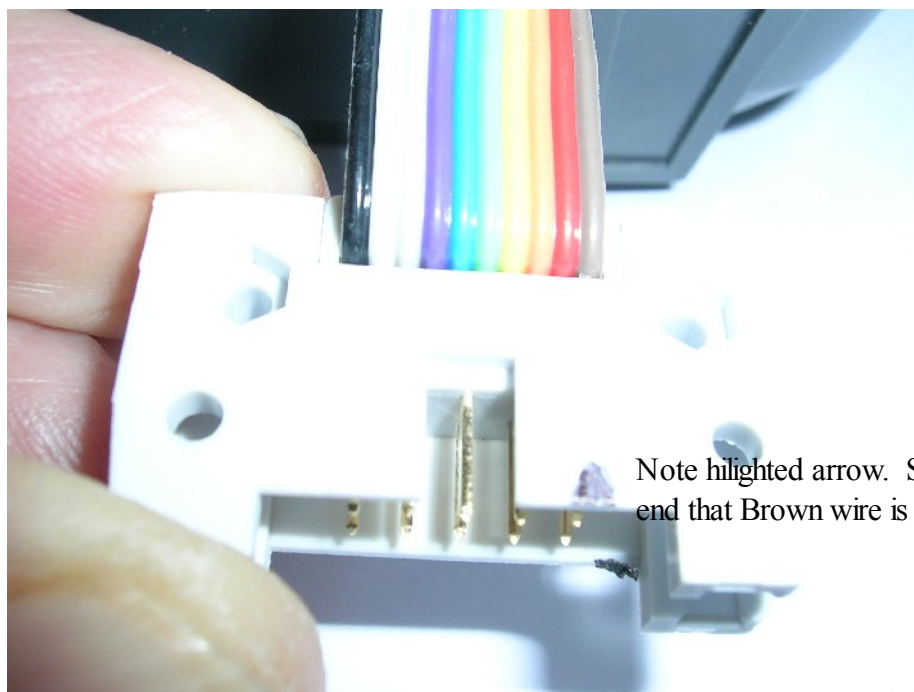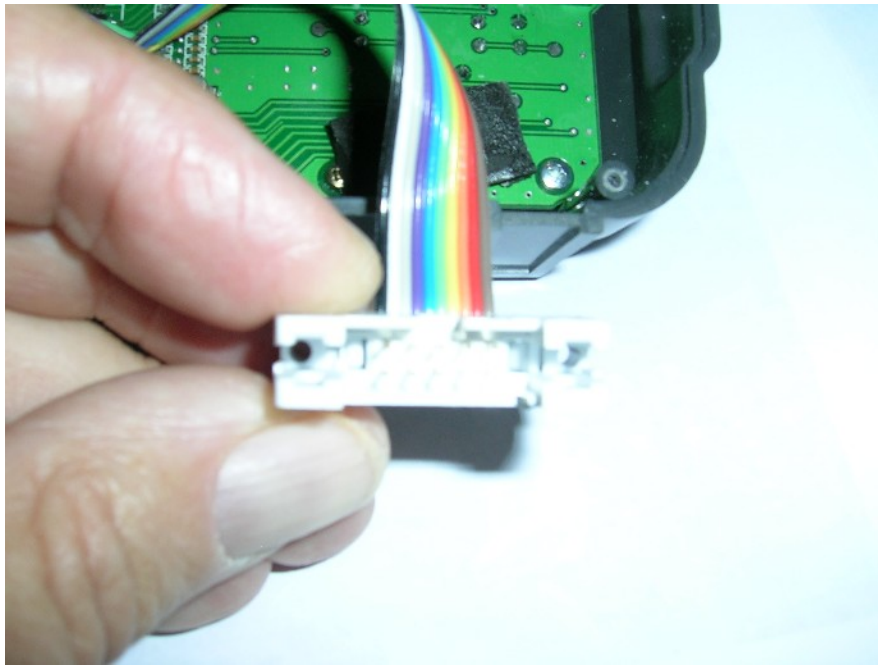
Note hilighted arrow. Should be on the
end that Brown wire is on.

 Measure the size of the opening of the 10 pin cable connector from the programmer and add about 1/16" (1mm) to the dimensions all around. Drill and file a hole in the bottom of the case to allow the cable from the programmer to pass thru the hole.   Note that the side of the connector on the cable from the programmer that the cable comes out of will require extra clearance. Drill two holes to accommodate two long 2-56 screws, and mount the cable connector to the bottom of the transmitter case with the 2-56 bolts and nuts. Ensure that the cable from the programmer can still be inserted.

You can unplug the soldering iron and hot glue gun as you are done with them.

Take the back of the transmitter case and plug the cable connector from it back into the main PCB. Fit the two halves of the case together, and while holding them, turn on the transmitter and make sure everything works normally. If they don't, recheck your solder joints for shorts and bridges.

Software Installation

The driver for the AVR Pocket Programmer does not have an installer, so it will need to be installed manually. Unzip the driver package, making sure everything in it is in a single folder.   Installation varies a bit for the various flavors of Windows. Some of the alternate programmers have installation programs. Follow their instructions instead.

On Windows 7 and Visa, plug in the the programmer with the USB cable to the computer. Windows should say that it is installing the driver firmware. After it churns for awhile, it should come up and say that the driver was not successfully installed.
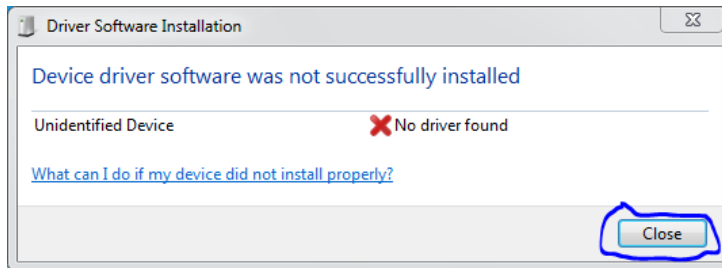
At this point, go to Start/Control Panel, and open up "Device Manager".
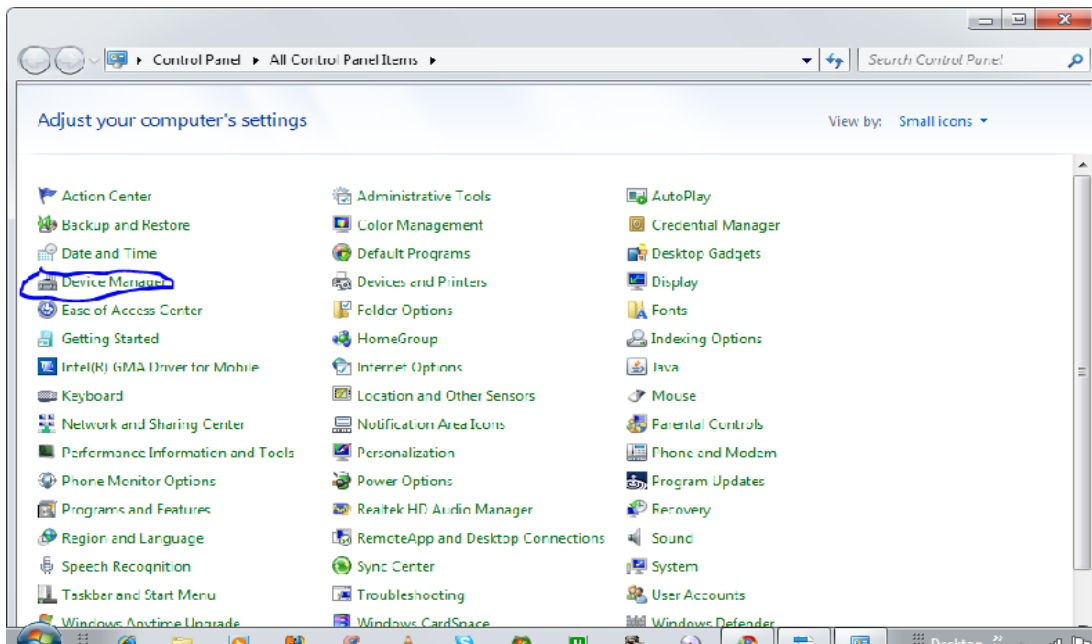
About halfway down the list you should see a "?" and Unknown USB device.
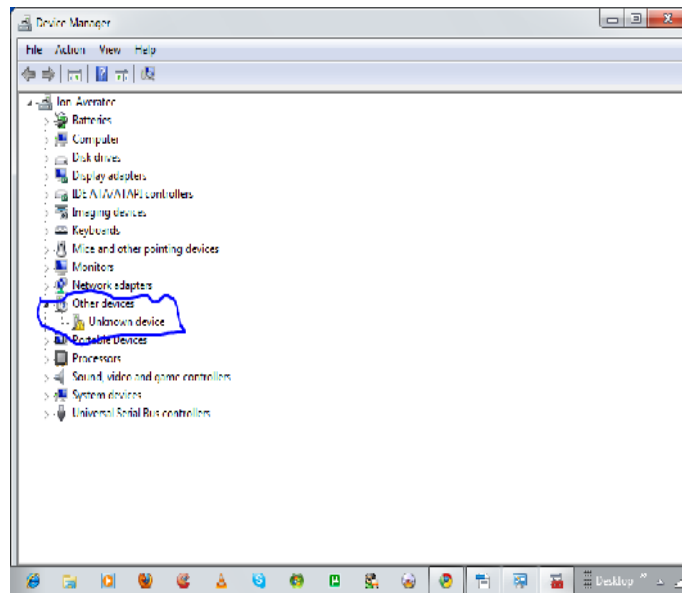
Right click on it, and select "Update Driver Software..". You will get the Window below:

At the resulting window, browse for the folder that you unzipped, and select ok.

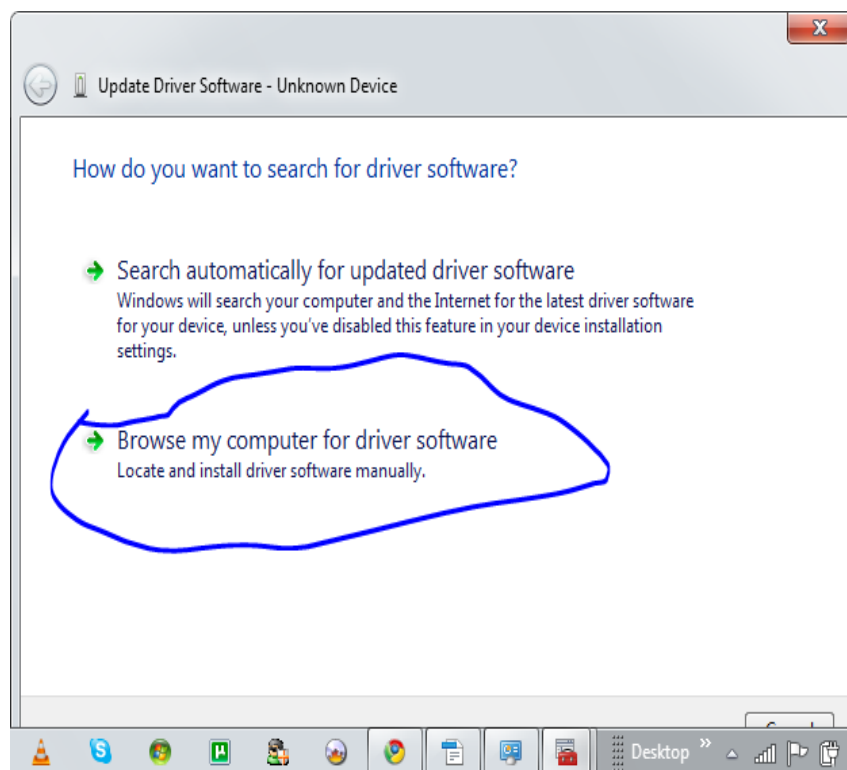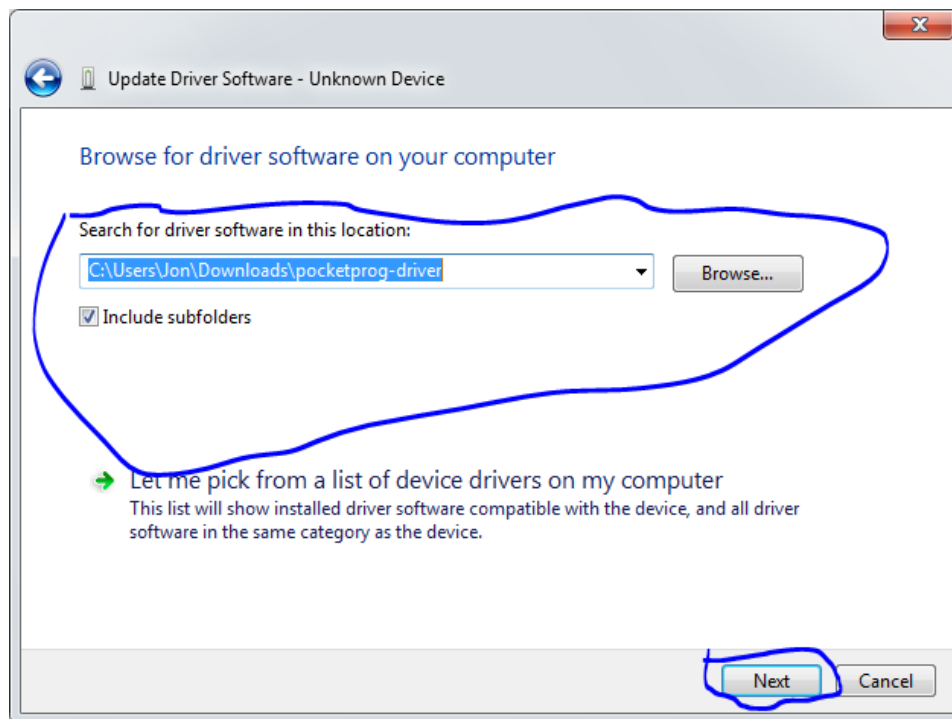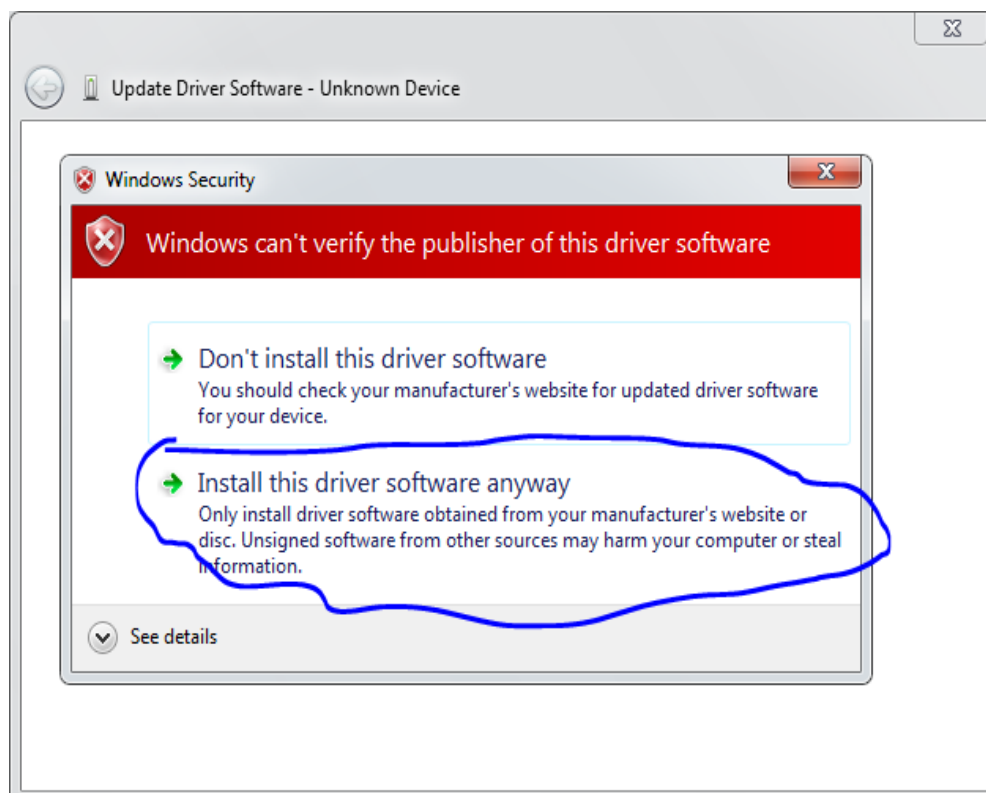Click Next, and Windows should start installing the driver software. You may get the following warning:

Select as shown above. When it is done, close the resulting window, and the Device Manager window. This concludes driver installation.
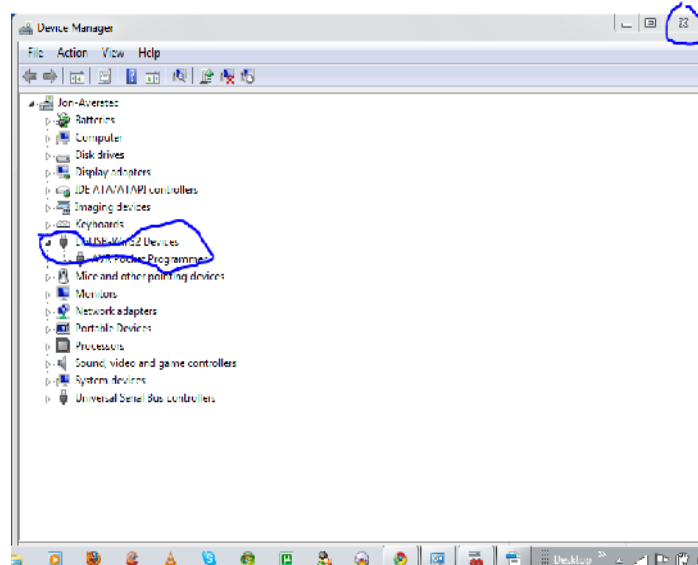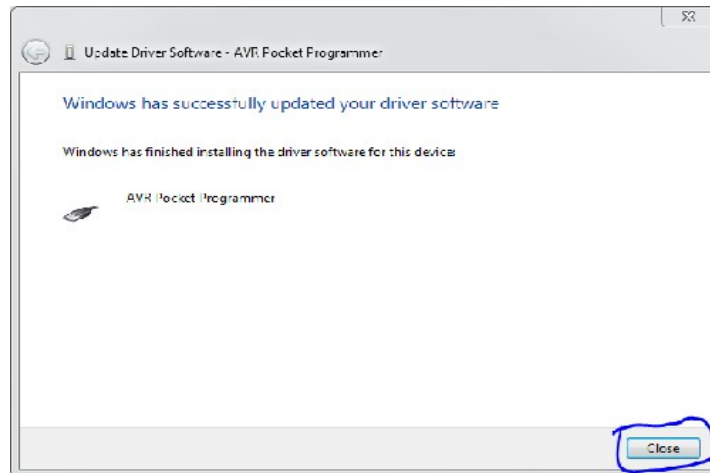
On XP, when you plug in the programmer, it will give you the option of installing the drivers. Browse to the unzipped folder, and allow it to install.

Next, install WinAVR. It is a huge program, over 200mb installed, we don't use most of it, but it contains AVRdude, which is the main program we do use, and this is the only way to get it. Just double click the installer, and allow it to install, using the default buttons along the way. You might get a minor error message, but don't worry, it will keep installing and finish.

Open File - Security Warning

The publisher could not be verified. Are you sure you want to run this software?

Name: ...rs\Jon\Downloads\WinAVR-20100110-install.exe

Publisher: **Unknown Publisher**

Type: Application

From: C:\Users\Jon\Downloads\WinAVR-20100110-inst...

[Run] [Cancel]

☑ Always ask before opening this file

🛡 This file does not have a valid digital signature that verifies its publisher. You should only run software from publishers you trust.
How can I decide what software to run?

Installer Language

Please select a language.

English

[OK] [Cancel]

WinAVR 20100110 Setup

Welcome to the WinAVR 20100110 Setup Wizard

This wizard will guide you through the installation of WinAVR 20100110.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

[Next >] [Cancel]

WinAVR 20100110 Setup

Choose Install Location
Choose the folder in which to install WinAVR 20100110.

Setup will install WinAVR 20100110 in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.

Destination Folder

C:\WinAVR-20100110   [Browse ..]

Space required: 262.2MB
Space available: 78.4GB

[< Back] [Next >] [Cancel]

Unfortunately, AVRdude is a command line program, and unless you are familiar with using the command prompt, it is a pain to use. Here's where AVR Burn-O-MAT comes in. It provides a GUI interface to AVRdude. It also has an install program. Double click on the install program, accept the

defaults, being sure to accept the license agreement. I also recommend checking the box to allow it to install a desktop icon.

Setup - AVR Burn-O-Mat

Select Start Menu Folder
Where should Setup place the program's shortcuts?

Setup will create the program's shortcuts in the following Start Menu folder.

To continue, click Next. If you would like to select a different folder, click Browse.

AVR Burn-O-Mat   Browse...

[< Back]   [Next >]   [Cancel]

Setup - AVR Burn-O-Mat

Select Additional Tasks
Which additional tasks should be performed?

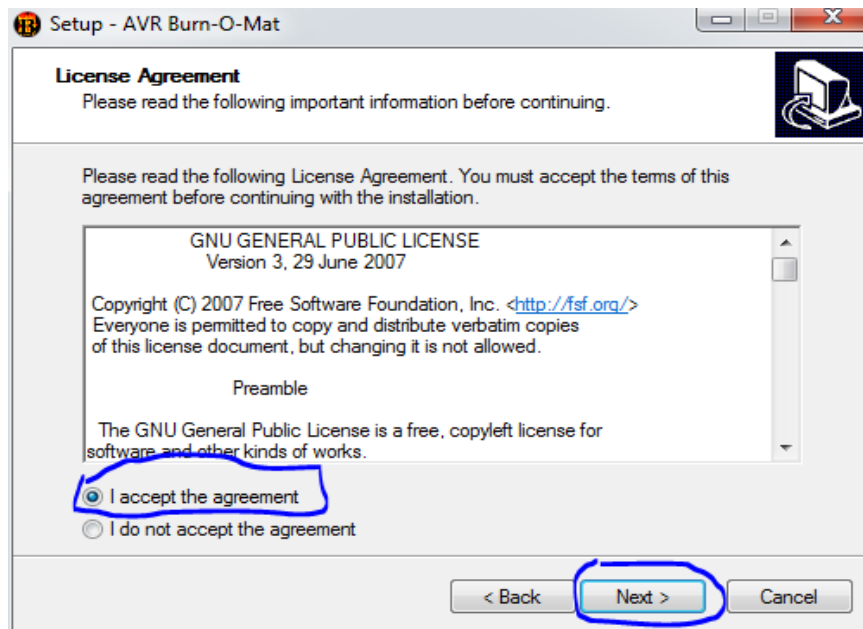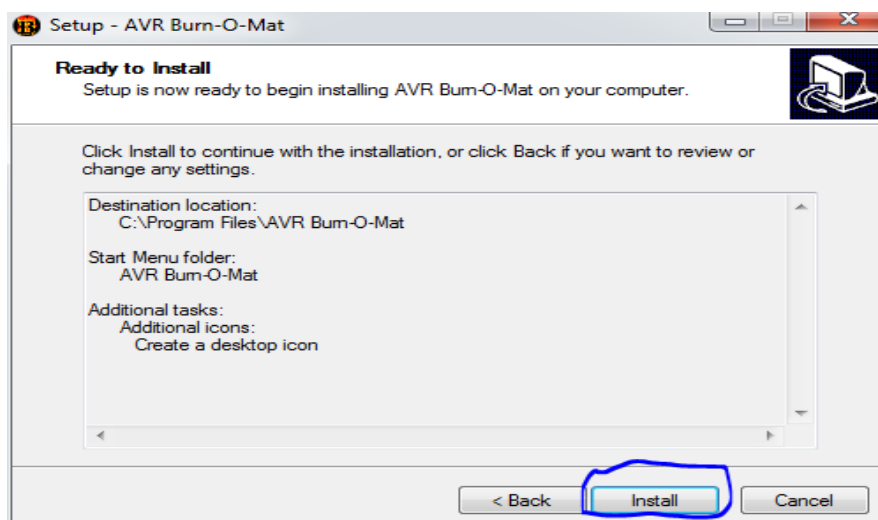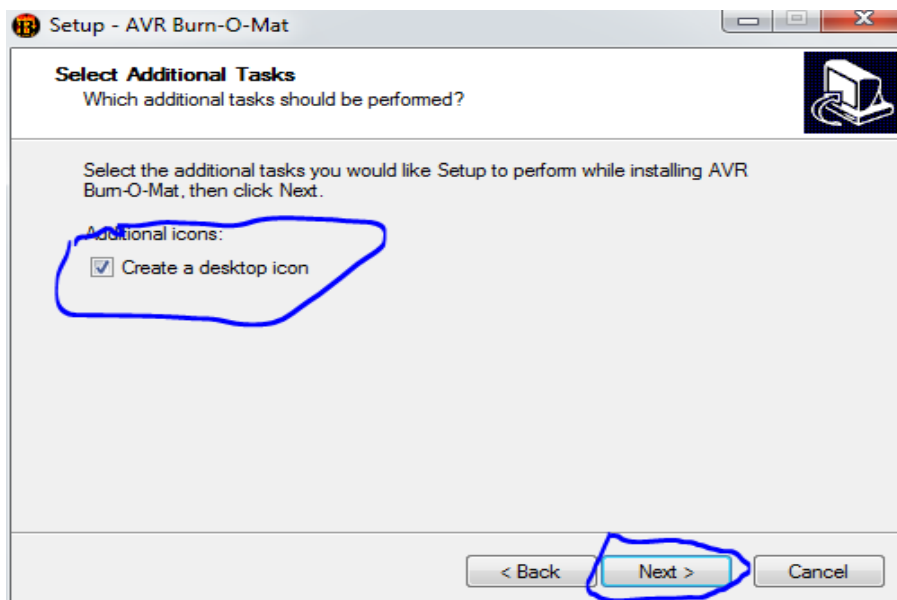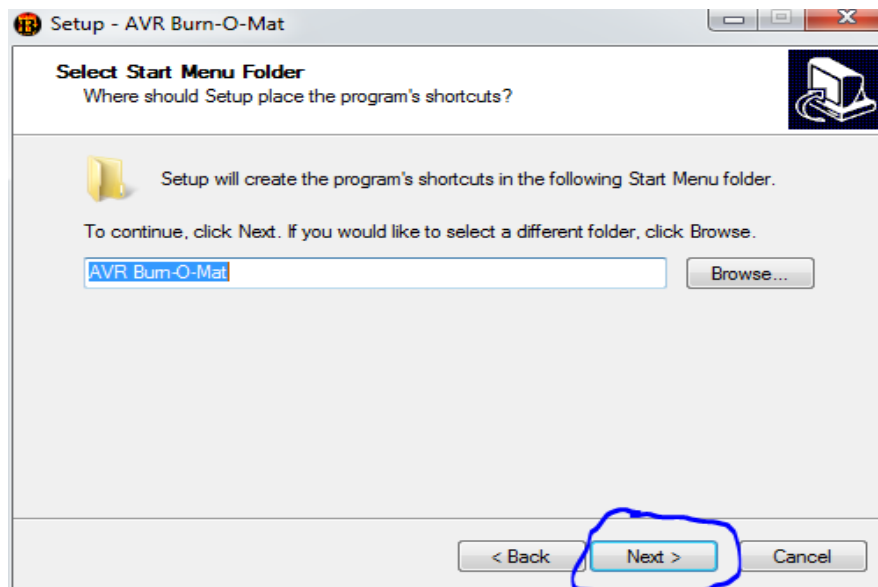Select the additional tasks you would like Setup to perform while installing AVR Burn-O-Mat, then click Next.

Additional icons:
☑ Create a desktop icon

[< Back]   [Next >]   [Cancel]

Setup - AVR Burn-O-Mat

Ready to Install
Setup is now ready to begin installing AVR Burn-O-Mat on your computer.

Click Install to continue with the installation, or click Back if you want to review or change any settings.

Destination location:
    C:\Program Files\AVR Burn-O-Mat

Start Menu folder:
    AVR Burn-O-Mat

Additional tasks:
    Additional icons:
        Create a desktop icon

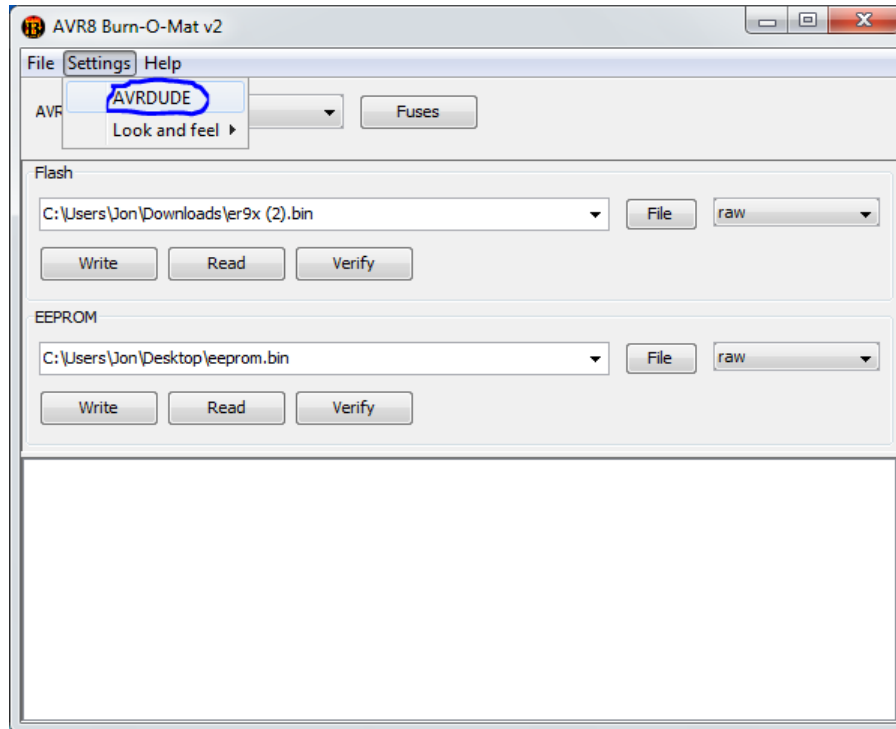[< Back]   [Install]   [Cancel]

At the end of the install, it will suggest letting it open AVR Burn-O-MAT. Go ahead and let it. If Burn-O-MAT doesn't open, or gives an error message, you will probably need to install the Java Runtime on the list above. Just click the installer, and use the defaults.

When AVR Burn-O-Mat opens, go to the menu, and select Settings>AVRDUDE.


This will open a dialog where you locate AVRdude using the upper "File" button. Navigate to the avrdude.exe directory, which, if you let it install using the defaults, will be C:\WinAVR-20100110\bin\avrdude.exe.
Then select the "File" button next to "alternative AVRDUDE configuration file", and navigate to the avrdude.conf file, which should be at C:\WinAVR-20100110\bin\avrdude.conf.
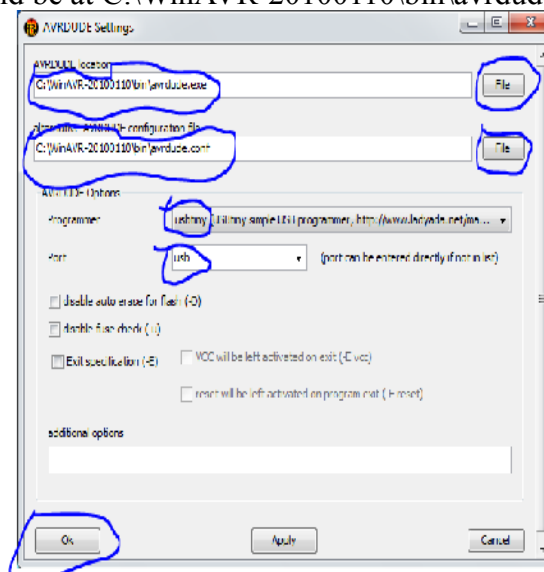
In the same dialog box, look at the drop down box for Programmer, and select "usbtiny". If there is nothing in the drop down box, select OK at the bottom, then close Burn-O-MAT and reopen it. Select Settings>AVRDUDE again. Now usbtiny should be in the drop down box for Programmer. Select it. Then select USB in the Port drop down box. Leave all other boxes on the page unchecked, and select ok at the bottom. (NOTE: If you are using a different programmer, use the name from the drop down box that matches your programmer.)

On the main screen of BURN-O-MAT, select Atmega64 from the dropdown AVR type box. Select raw in both drop down boxes, next to FLASH and EEPROM.
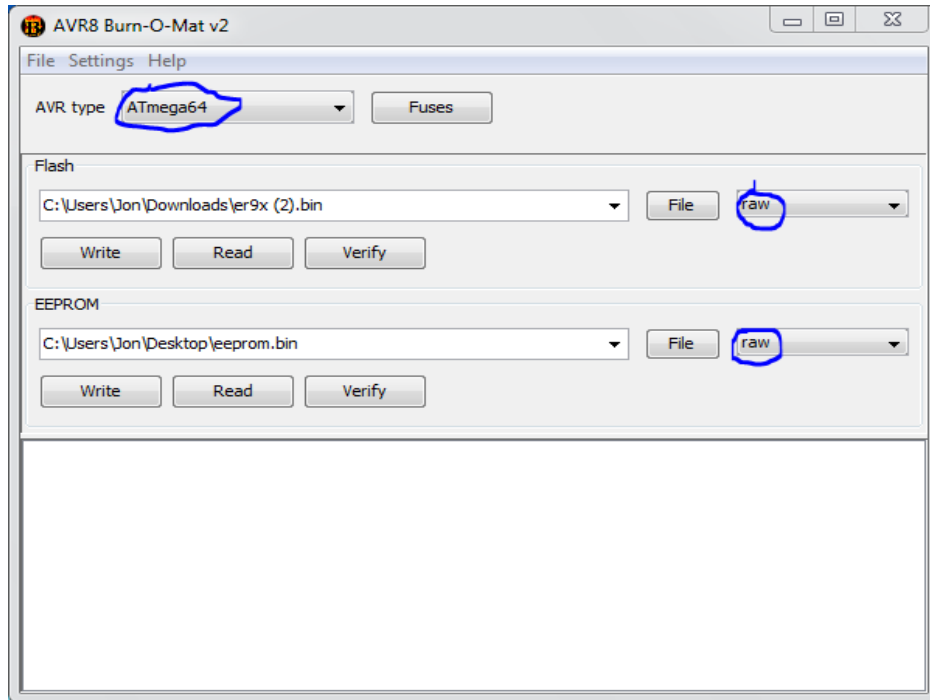
Backing up Flash and EEPROM

Since the first thing we are going to do is backup the FLASH and EEPROM in your 9x, we need to specify file locations for the files we are going to download. I suggest C:\Users\<user name>\Desktop\flash.bin and C:\Users\<user name>\Desktop\eeprom.bin for the flash and eeprom files, respectively.
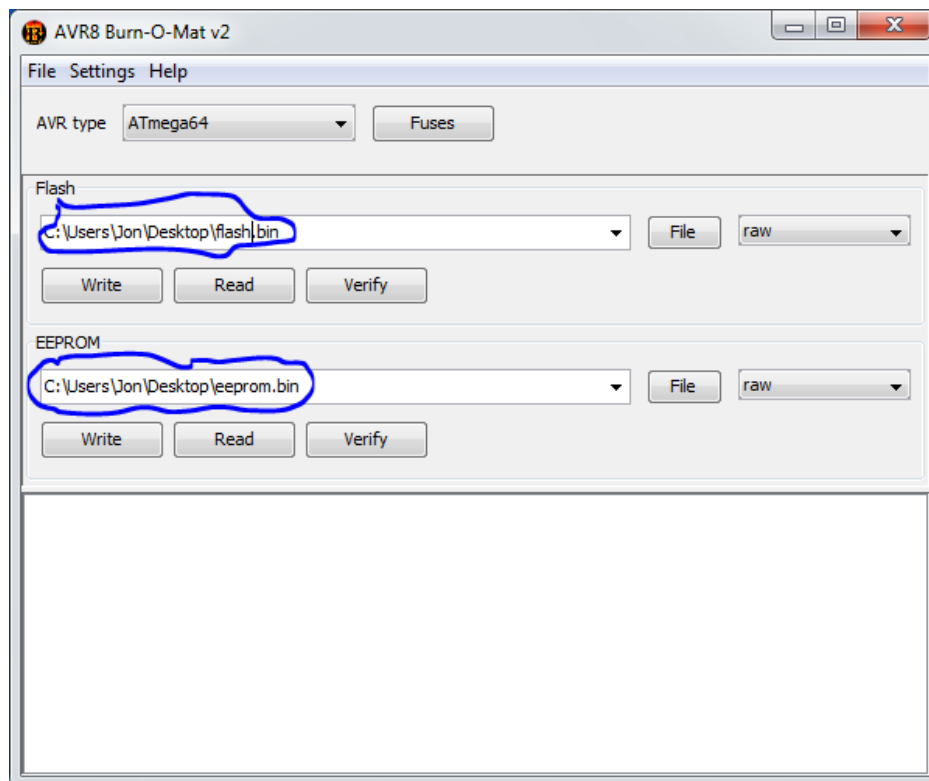
We are almost there! Now, plug the programmer cable into the transmitter noting the key of the connector. Don't force it in the wrong way. Look at the Pocket Programmer. On the end next to the cable connection to the 9x, there is a very small switch which allows the computer to power the 9x thru the programmer. Make sure the switch is set to the "Power Target" side.


Now plug the usb cable from the programmer into the computer. If everything is connected correctly,

the main screen of the transmitter should power up. Make sure to clear any Switch Error screens by flipping the switches to the up/back position. If it doesn't power up, disconnect everything, and double check the connections inside the 9x. Plug just the programmer into the computer, and make sure the leds on it light up. There should be two blue ones and one red one lit. If everything looks correct, plug everything up again.

Assuming you get the main screen on the 9x, hit the Read button under FLASH on Burn-O-MAT. This will read your current firmware from the 9x and save it to your computer.   More leds will light up on the programmer. You should see the status in the pane on the lower part of the BURN-O-MAT window. After about 30 seconds or so, it should show complete. How hit the Verify Button under FLASH. This will check the file you just saved to the firmware on the 9x and make sure they are identical.

Now do the same thing for the EEPROM portion of BURN-O-MAT. That will save and verify the EEPROM which contains all of your models settings and other saved information.
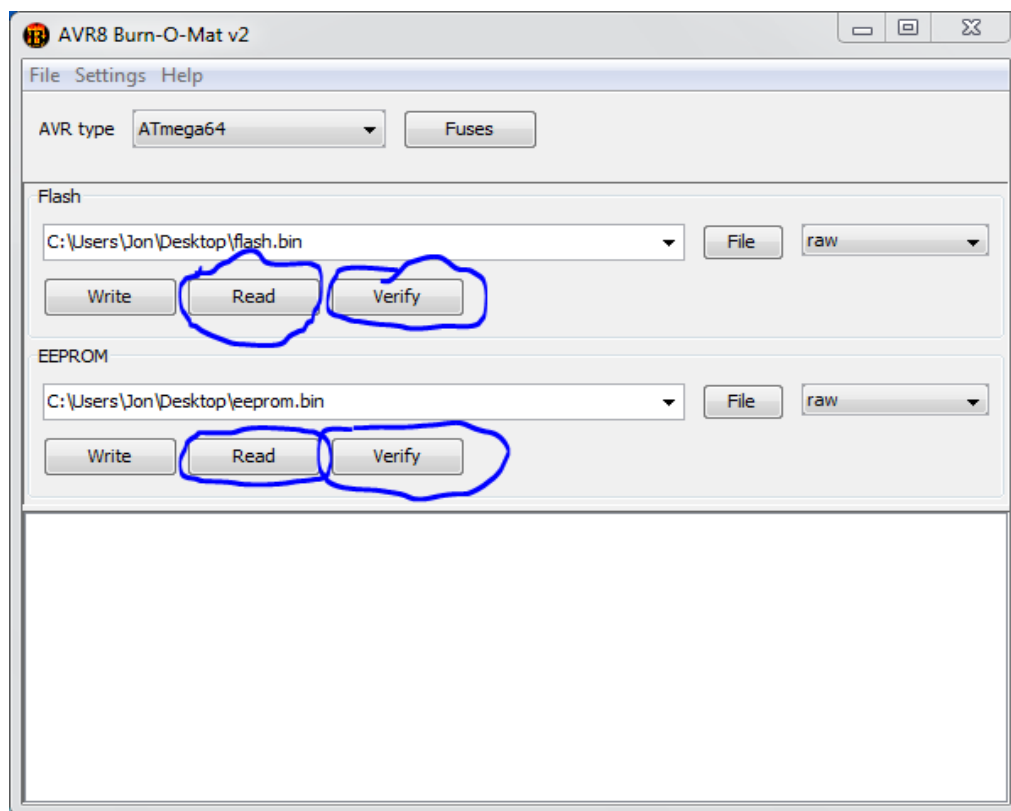
If all of that went well, you have now backed up everything on your 9x, and are ready to flash new firmware.

Flashing New Firmware

Since you are here, you must be wanting to flash different firmware to your 9x. The latest er9x firmware is here:

http://code.google.com/p/er9x/

The latest Thus firmware is here:

http://code.google.com/p/th9x/

And Turnigy V2 firmware can be found in this thread:

http://www.rcgroups.com/forums/showthread.php?t=1035575

With the Turnigy firmware, you also need an eeprom file, and flash it too. It can usually be found with the V2 firmware. You can PROBABLY use your backed up eeprom file, but either check any saved settings carefully after flashing, or reset the entire eeprom to defaults after flashing it. You do this by pressing and holding the EXIT button on the 9x as you turn it on. It will emit a continuous beep. After 10 or 15 seconds, the beep will stop, and you will be given the default screen on your 9x.

With either the er9x or the th9x firmware, you do not need to flash the eeprom if this is your first time flashing either firmware. The firmware will reset the eeprom once you have flashed the firmware.

Ok. Fire up BURN-O-MAT. To flash the firmware, navigate to your new firmware on your computer by hitting the File button under Flash.
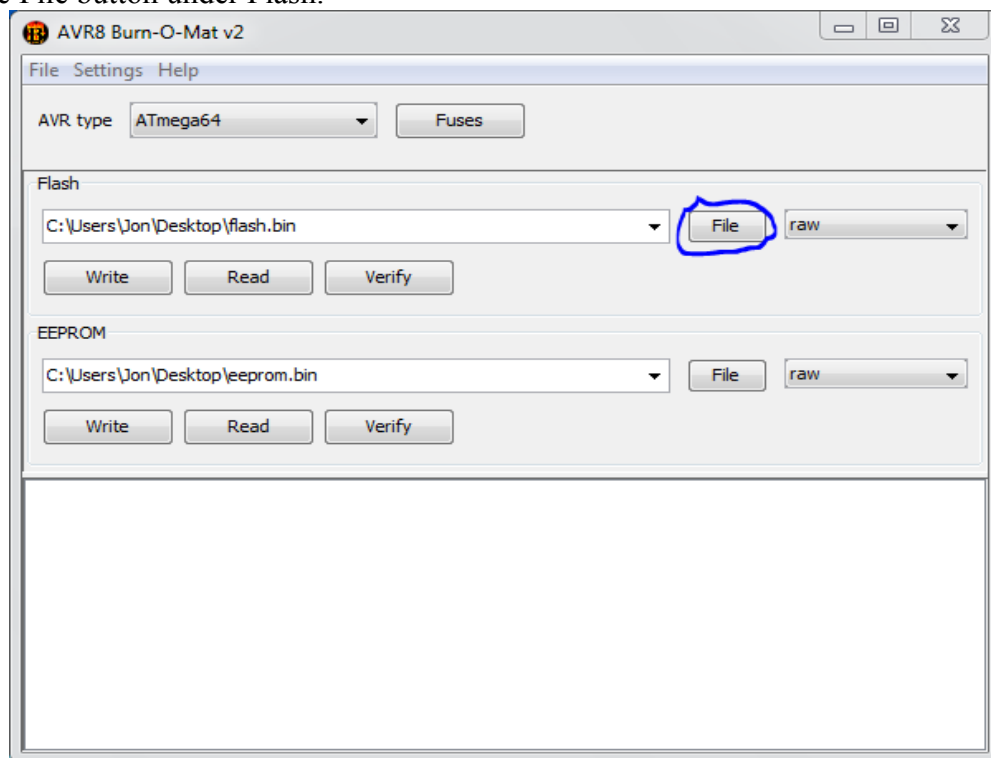
Find it, and click Open. Note that BURN-O-MAT assumes you are looking for a .hex file, so hit the dropdown box, and select Any File.
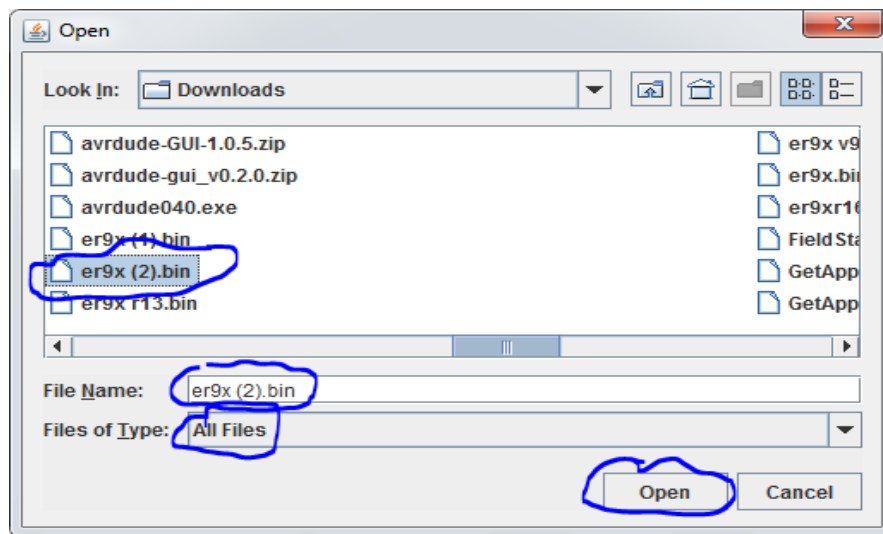
The th9x firmware is always provided in a .bin format. The er9x firmware is now in the .hex format The Turnigy firmware can be found in either .bin or .hex format. Once you have selected your firmware, make sure the drop down box under Flash says raw for a .bin file, or Intel Hex for a .hex file. When you are sure BURN-O-MAT is pointed to the correct file, press the Write button.
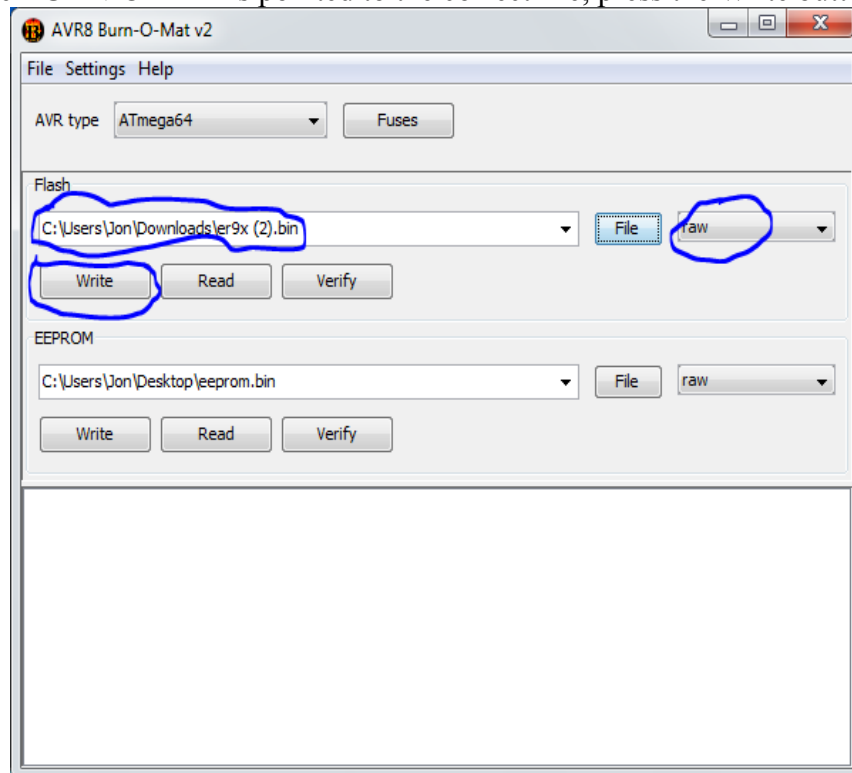
You should see the status in the lower pane.
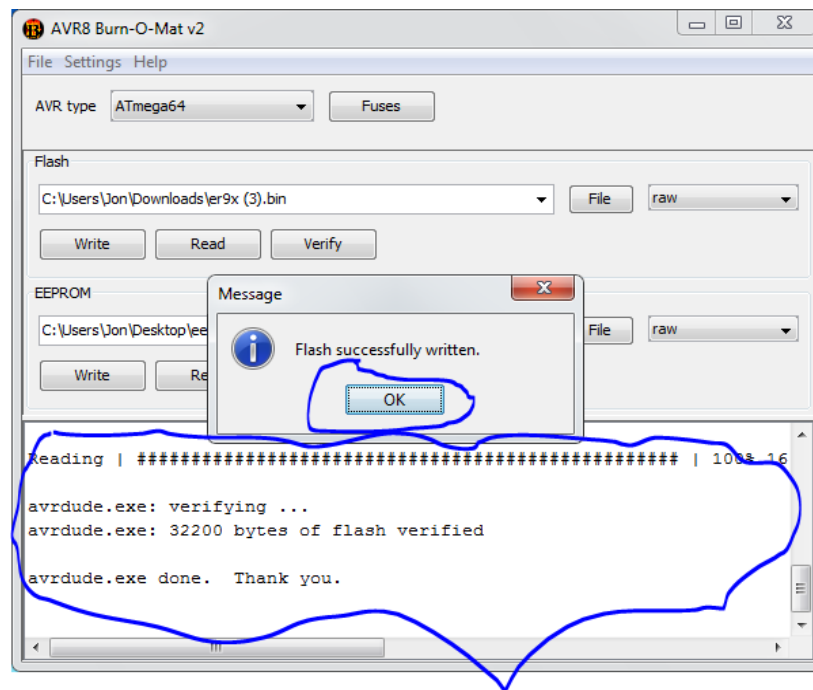
It will automatically verify what you wrote, so you don't need to do a separate verify after writing. If everything went well, you will get an error screen on your 9x about the eeprom. For the er9x and th9x firmware, press any key, and the eeprom will be formatted. For the Turnigy V2 firmware, you will need to load an eeprom file. Just follow the instructions above for flashing the firmware, only use the EEPROM area of BURN-O-MAT and be sure to select the right file.

After Flashing Your Firmware

After flashing your new firmware (and eeprom, if applicable), you will need to calibrate the sticks on your 9x for centers and endpoints. You calibrate the sticks in the er9x and th9x firmware by following the instructions in the er9x or th9x manuals, respectively, here:

http://er9x.googlecode.com/svn/trunk/ER9x%20Users%20Guide.pdf

http://th9x.googlecode.com/svn/trunk/doc/th9x-en.pdf

The instructions to calibrate the Turnigy firmware are below. They are a direct lift from my post on RC Groups here, based on instructions on a German site:

http://www.rcgroups.com/forums/showpost.php?p=15328341&postcount=2415

Push the right lower trim tab to the left (aileron on a mode 2 TX), and the left side trim tab up (Throttle trim on a mode 2 tx), and while holding them, turn the Tx on. You will get a screen that shows the version number of the firmware, with four zeroes (0000) at the top of the screen. Center both sticks in their range in all axis, and press the menu button until it beeps and release. The screen number will change to 0001 Move the right stick to the upper right corner, and press menu, and you should get a beep, and the number on the screen will change to 0002. Put the right stick in the lower left corner, and

press menu, and get a beep, and the number will change to 0003. Release the right stick, and put the left stick in the upper right corner, and press menu, get the beep, and the number will change to 0004. Put the left stick in the lower left corner, and press menu again, get the beep and the number will change to 0005. Center both sticks, and press menu, get the beep. You are done calibrating the sticks.

While at the same screen, press the + key, the screen will change, and you will get the position of the controls in hex code. You can see the numbers change as you move the sticks or knobs. Press - to go back to the firmware version screen. Exit the firmware screen, and go to the Display menu item. As long as you haven't turned the TX off, you will see the hex codes for stick positions for the 4 primary controls. Once you turn the tx off and back on, and go back to the Display menu item, the numbers will disappear.

That's it.

Conclusion

That's all folks! If you have questions about this or other firmware questions, visit the thread on RC Groups, here:

http://www.rcgroups.com/forums/showthread.php?t=1266162&page=28#post15803337

Version 1.2, 20 Sep 2010; revised to add different instructions for calibrating er9x, change from .bin to .hex for er9x, and abbreviated instructions for x64 bit systems.
Version 1.1, 17 Aug 2010; original release
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