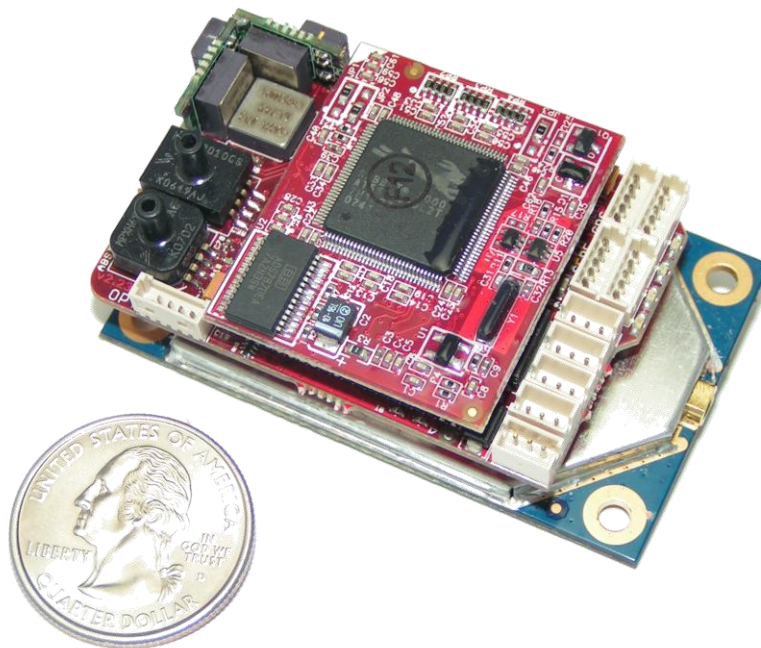


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# Kestrel Autopilot System

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Autonomous autopilot and ground control  
for small unmanned aerial vehicles



## Updating Firmware Guide

10/27/08  
Version 1.5



## Overview

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### Firmware Description

Firmware is the embedded software that is stored permanently in volatile memory and run in microprocessors and microcontrollers. Firmware is stored and run on both the Kestrel Autopilot and the Commbox. Functional improvements to the Kestrel Autopilot and Commbox are made possible by upgrading the corresponding firmware. This document outlines the recommended procedures to be used for updating the firmware of the Kestrel Autopilot and Commbox.

### Latest Firmware Versions

A description of the latest firmware versions available for the Kestrel autopilot and Commbox are found at [www.procerusuav.com/login.php](http://www.procerusuav.com/login.php).

## Updating Firmware

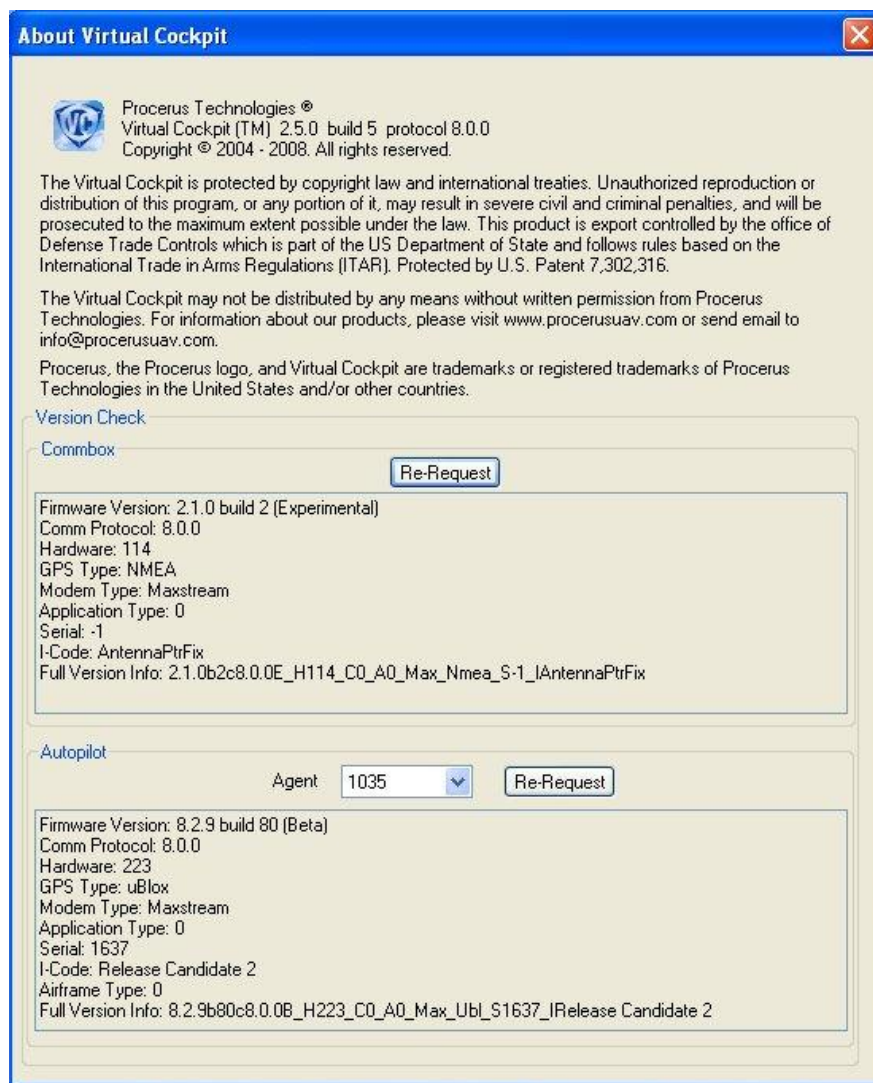
This document describes the process of updating the Kestrel Autopilot and Commbox firmware. Please review this information thoroughly before beginning.



**Note:** The Kestrel Autopilot and Commbox firmware and the Virtual Cockpit are designed to work with each other. When updating firmware, be sure that the autopilot, Commbox firmware versions, and Virtual Cockpit are compatible.



**Note:** The Virtual Cockpit may be used to identify the Commbox firmware version. (See **Error! Reference source not found.**) Make sure the Commbox is connected and communicating with the Virtual Cockpit. Open the **About Virtual Cockpit** dialog window. This is found by selecting **Help** → **About Virtual Cockpit**. The information in this dialog can be used to validate that the correct firmware version is loaded.



**Figure 1.** Virtual Cockpit used to identify firmware versions.

# Updating Firmware Guide

## 1.1. Updating Kestrel Autopilot Firmware

The following steps outline the procedure to update the Kestrel Autopilot firmware.

### Connect Programming Cable

Connect the programming cable to the autopilot programming port (serial port A). Do not turn on the autopilot yet.

Simply plug the small 5 pin (1.25mm pitch) plug into the autopilot programming port. The programming enable plug should be connected.

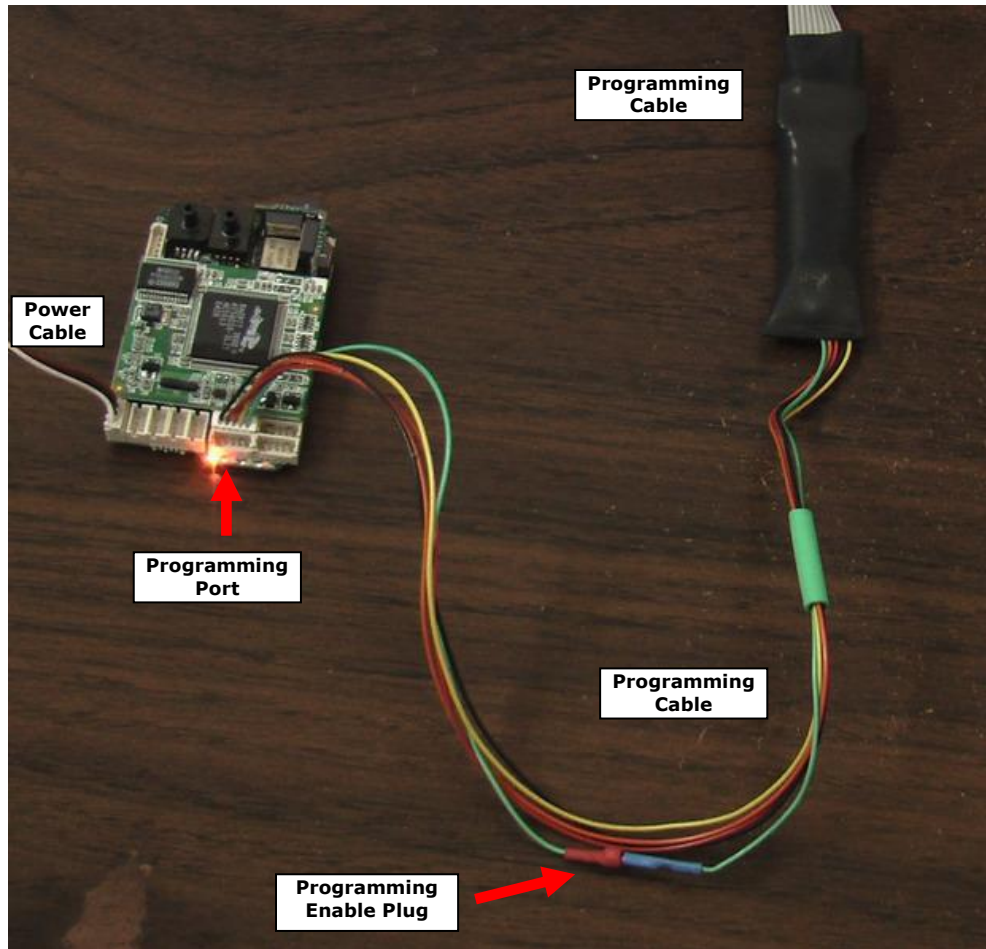
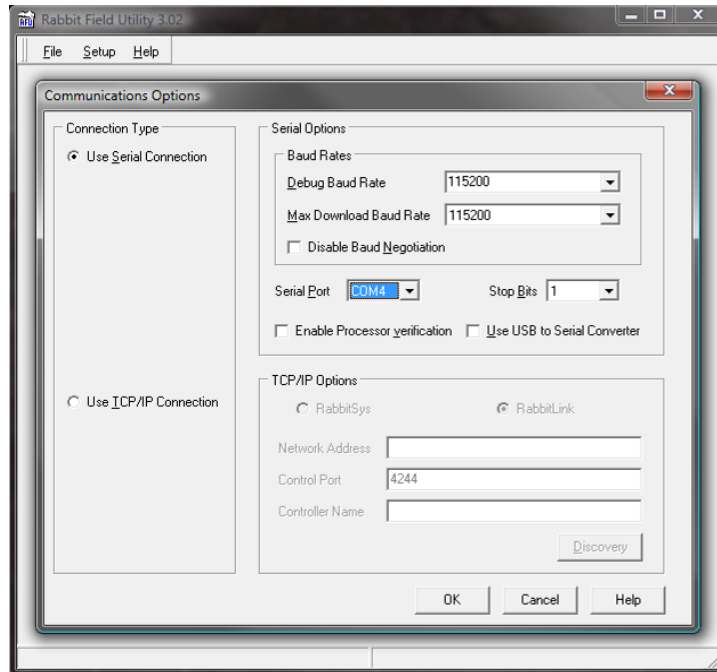


Figure 2. New programming Cable.

### Open and Configure the RFU

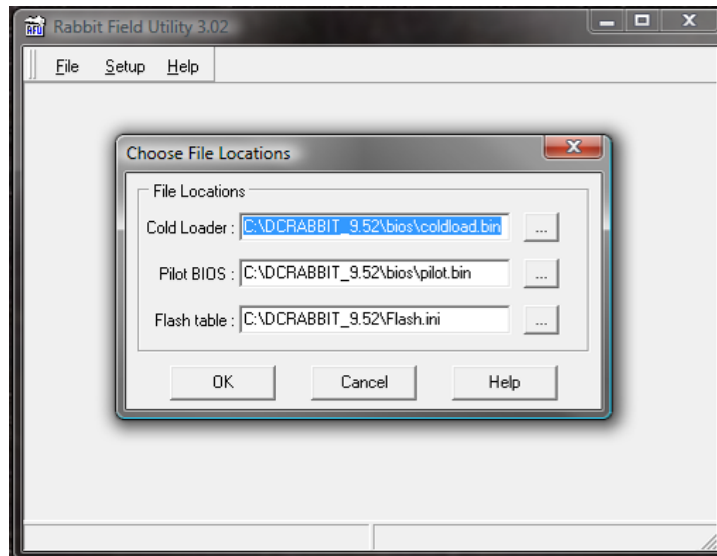
Run the Rabbit Field Utility (RFU) by double clicking on the file RFU.exe. Select the correct Comm serial port in the Communications Options window. This can be found under the menu "Setup → Communications". If you are programming a version 2.x autopilot and using a programming cable adapter, uncheck the Enable Processor Detection option in the Communication Options window.

# Updating Firmware Guide



**Figure 3.** RFU Communications Options.

Next, select the file locations for the Cold Loader, Pilot BIOS, and Flash table. This is done by selecting the menu “Setup → File Locations...”. You will need to tell the RFU where the files **COLDLOAD.BIN**, **pilot.bin**, and **Flash.ini** are located. These files are located in the RFU directory with the RFU.exe file.



**Figure 4.** File locations.

## Turn on Autopilot

Turn the autopilot on. The autopilot amber power LED will light.

# Updating Firmware Guide

## Load the Firmware Binary

Under the File menu of the RFU, select Load Flash Image.

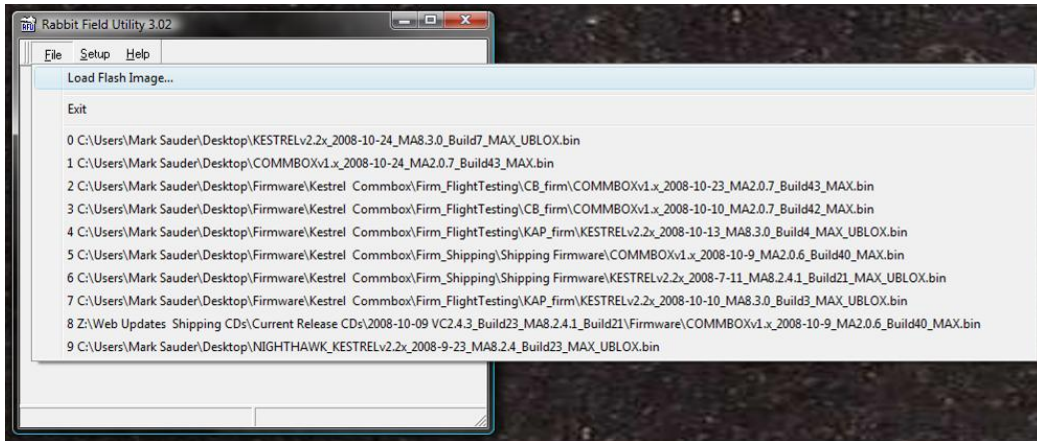


Figure 5. Load Flash Image

A dialog will open that will allow you to browse to the firmware binary file that will be loaded onto the autopilot. Per your autopilot hardware version, the correct autopilot firmware binary must be loaded. Make sure that the binary loaded matches the hardware type. The binary filename will indicate the hardware version it is intended for (i.e. “KESTREL\_2008-10-23\_MA8.3.0\_Build4\_MAX\_UBLOX.bin” should only be loaded onto Kestrel v2.1 and higher autopilots). Locate and select the correct binary file and click Open.

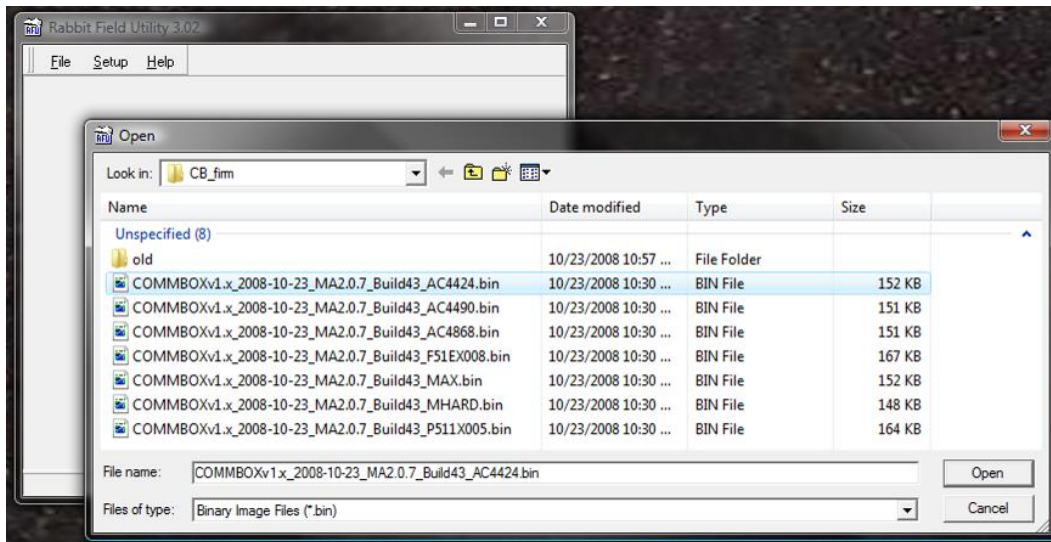
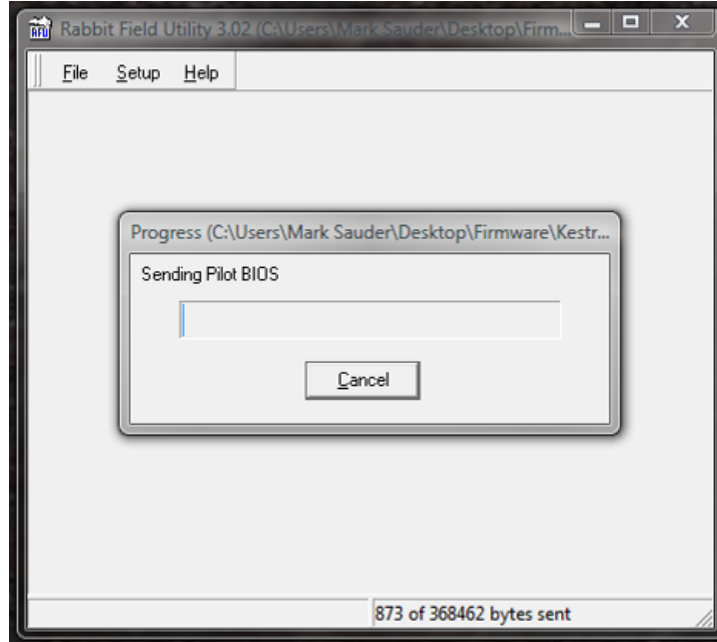


Figure 6. Locate proper Firmware binary

Click Open to start loading the firmware binary on the autopilot.

A dialog window will open immediately indicating load status. This dialog window will close when downloading is finished.



**Figure 7.** Load Status window.

### **Verify Proper Firmware Update**

After the load status window closes, verify the firmware was updated by unplugging the programming cable and power cycling the autopilot (disconnect and reconnect the battery). The autopilot should begin running normally. This is apparent when one or more of the LEDs start flashing.

If the Commbox and Virtual Cockpit are connected and running, you should see the autopilot agent status in the Virtual Cockpit, indicating communication has been established. Once communications with the autopilot is established, observe the autopilot attitude as displayed in the Virtual Cockpit Heads-Up-Display (HUD).



**Warning:** If the autopilot attitude appears unstable (i.e. the artificial horizon continually tumbles) it is likely that the autopilot is not calibrated for temperature compensation. In this case, contact Procerus Technologies.

## 1.2. Updating Commbox v1.1

The following steps outline the procedure to update the Commbox v1.1 firmware. Updating the Commbox firmware follows the same procedure as updating the autopilot firmware, it simply uses a different binary file. Please read the previous section thoroughly before beginning. The Commbox is programmed directly through the RS232 cable that is typically used for operating the Commbox. Connect to the Commbox as shown in **Error! Reference source not found.**. Select the appropriate firmware binary file and upload in the same manner as described in Section 1.1.



**Figure 8.** RS232 cable connected to Commbox.

### **Verify Proper Firmware Update**

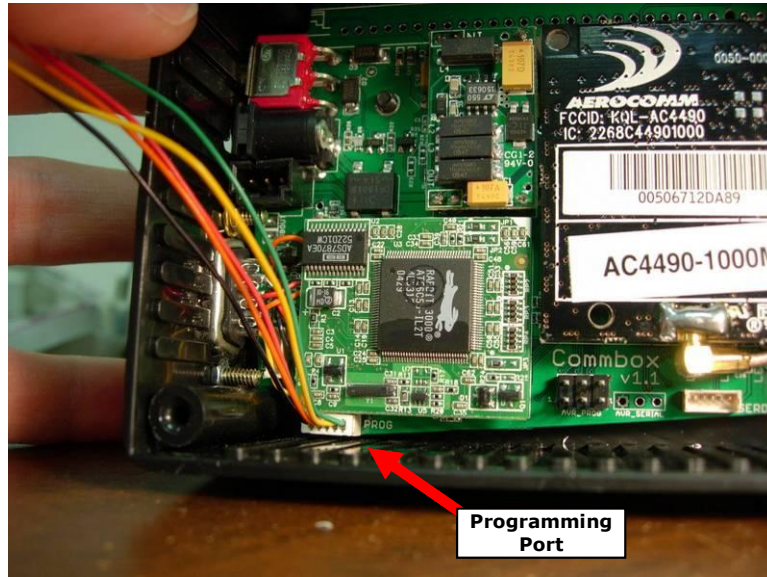
After the load status window closes, verify the firmware was updated by unplugging the programming cable and power cycling the Commbox. (Cycle the power switch on the Commbox or disconnect and reconnect the battery). Normal operation should begin.

An optional method of connecting to the Commbox to update firmware is described on the next page.

# Updating Firmware Guide

## Optional Method – Using the Internal Programming Port

An internal programming port provides an optional method for programming the Commbot. This port is located next to the Rabbit microcontroller module and is labeled **PROG** on the circuit board. This internal programming port may be used for Commbot software development or when programming over the external RS232 cable is not possible. The internal programming port follows the same convention used for programming the Kestrel v2.2 autopilot and uses the same programming cable and pigtail.



**Figure 9.** Internal Programming Connection



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*Literature Requests – At Customer Login*  
<http://www.procerusuav.com/login.php>

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