DragonLink V2 User Guide

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Dragon Link...
   Professional Grade FPV
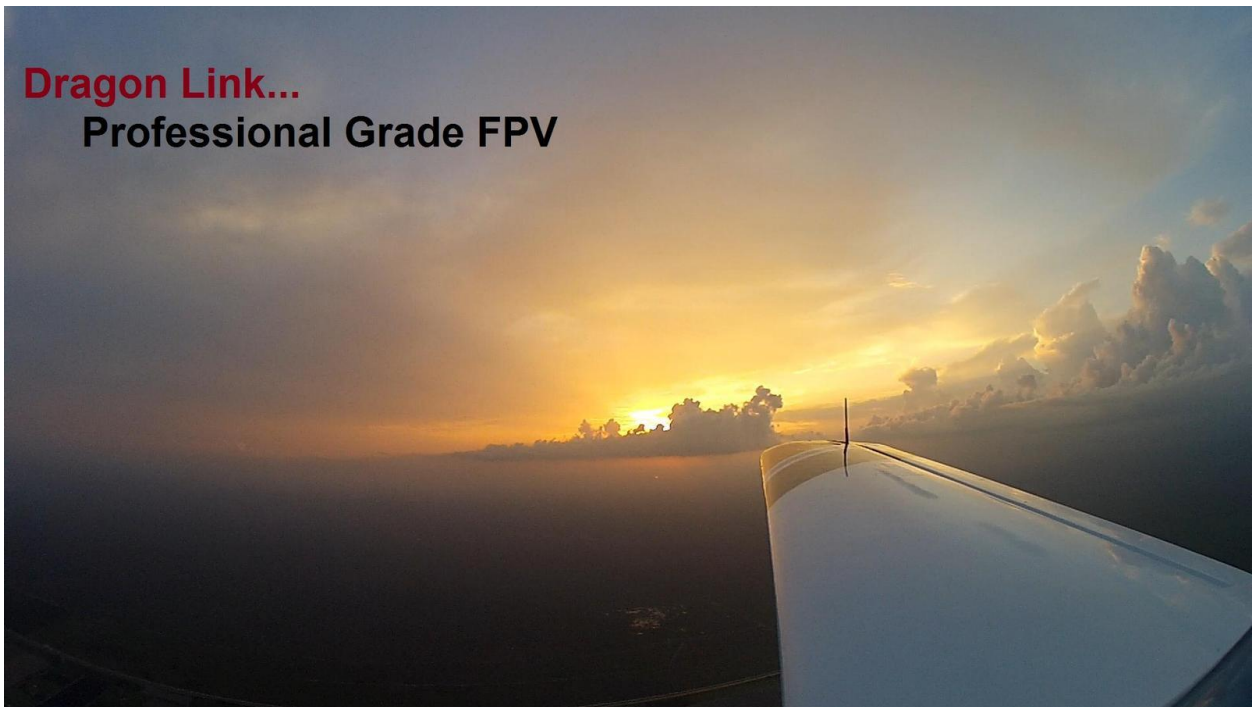
Quick Start Checklist

The following steps will get your DragonLink setup and ready for flight. Please be sure to review the warnings in **bold**, and it is recommended that you read this list once over before performing it, in order to familiarize yourself with the setup process. Some of these steps are explained more in depth in later parts of this guide; a more expansive explanation of these setup procedures is available by simply skipping this section and following the chapters in order starting with the section titled "PPM".

1. Connect the DragonLink Transmitter to your RC transmitter. Power, PPM and Ground must all be connected to their respective pins, as shown in the section titled "*PPM*".
2. If you have a headtracker, connect it now. Please see the section titled "*Headtracker Configuration*" for more information.
3. If applicable, set your RC transmitter to output in "PPM mode" or activate your trainer port. These options will change depending on your radio. You may need to check your user manual for specifics.
4. Connect an SMA antenna to the DragonLink Transmitter. ***Do not operate the DragonLink transmitter without either a properly tuned (70cm band) or dummy load attached to the antenna port! Failure to comply with this warning can or will result in the RF frontend of the transmitter burning out.***
5. Turn on your RC transmitter as well as the DragonLink. You should see a solid GREEN light. ***If you get anything other than a solid GREEN light, you <u>must</u> stop here and troubleshoot why your DragonLink is not getting a PPM signal***.
6. Connect the DragonLink receiver to your power supply. 5-6 volts is recommended for input power. ***Using voltages higher than 5-6 volts may damage your servos or other attached equipment!***
7. Attach the servos/ESCs/other devices to the DragonLink's servo ports. If you need to, you can connect PPM and/or RSSI at this time.
8. Install the SMA antennas on both the DragonLink transmitter and receiver
9. Change the ID of the transmitter with the following steps. See the section titled "*ID Change*" for more information.
    a. Start with the DragonLink TX powered off
    b. Press and hold the bind/menu button on the top of the DragonLink TX
    c. Apply power to the DragonLink TX.
    d. Wait. The LED will flash several sequences of colors. Continue to hold the button down.
    e. After less than thirty seconds, the LED will go completely dark.

f. If the LED has not gone completely dark after 30 seconds, start from step "a" again.

g. Release the button, and power cycle the DragonLink TX.

10. Bind the DragonLink pair with the following steps. See the section titled "*Binding*" for more information.

    a. Start with both the DragonLink TX and RX powered off.

    b. Press and hold the bind/menu button on the DragonLink TX.

    c. While holding the button, turn the DragonLink TX on.

    d. Hold the menu button until the LED becomes YELLOW

    e. The DragonLink's LED should now be flashing YELLOW. If it isn't, restart the process from step 1.

    f. Power on the DragonLink RX.

    g. The DragonLink RX's "status" LED will come on.

    h. Power cycle the DragonLink TX.

    i. As soon as the DragonLink TX comes on, the DragonLink RX's "status" LED should go dark.

    j. Power cycle the DragonLink RX.

11. At this point, you should have RC control of the servos and/or other equipment attached to your DragonLink. Verify again that you have both a green light on TX and a blue link light on the RX. You must have both of these before continuing.

12. Now, set the failsafe on the DragonLink RX. See the section titled "*Setting the Failsafe*" for more information.

    a. Start with the DragonLink TX and RX on, as well as the RC transmitter. You must have a green light on the DragonLink TX, and a blue light on the DragonLink RX indicating a link before proceeding.

    b. Put the sticks and switches into the configuration they must be in during a failsafe condition.

    c. Press and hold the failsafe/menu button on the DragonLink TX for at least 5 seconds.

13. Perform the preflight and range check. See the section titled "*Preflight and Range Check*" for more information.

    a. Check all cables and interconnects.

        i. All connectors should be snug

        ii. The SMA antenna connectors should be smug, but not over tightened.

        iii. Cables should be free from fraying, exposed conductors

   iv. Verify all wires follow the connectors into their housing and there are no wires on the verge of removing themselves from secure crimps

 b. Check that the antennas are connected on both the DragonLink TX and RX

 c. Power the DragonLink on in MicroPower Mode (See the section titled "*RF Output Power Levels*"). Verify a flashing green light on the TX and blue light on the RX.

 d. Walk off between 20 and 30ft holding the DragonLink transmitter as you go. If the aircraft is placed on a table, you should start to see a failsafe around 20-30ft. If the range before failsafe is much shorter than this, you have a problem with your configuration and you must check this before flight.

 e. If you surpass this distance without a consistent failsafe, you are OK for flight.

14. This concludes the DragonLink setup process.

DragonLink Hardware

Transmitter (TX)

The DragonLink transmitter is the black box in your kit with the DragonLink logo on it.

The top of the transmitter includes (from left to right):

1. The bind/menu button
2. The multicolor GREEN/RED/YELLOW LED
3. The SMA 70cm band antenna port
4. The RF power level switch

The bottom of the DragonLink includes (from left to right):

1. The transmitter PPM and power connection
   a. Pinout (3 pins, left to right)
      i. PPM signal in
      ii. Power in
      iii. Gnd
2. The headtracker PPM and power connection
   a. Pinout (3 pins, left to right)
      i. PPM in
      ii. Power out
      iii. Gnd
3. The firmware upgrade serial port

Receiver (RX)

The DragonLink receive has connections for up to twelve servos, PPM output, RSSI output, antenna and a serial port permitting in field update. Note the position of the ground, signal and power pins. Ground will always be the closest pin to the circuit board, while power will always be the middle pin and signal will always be on top. Signal pins will either be RSSI output, servo output or PPM output. Refer to the silkscreen labeling on the top of the DragonLink RX for the locations of these pins.
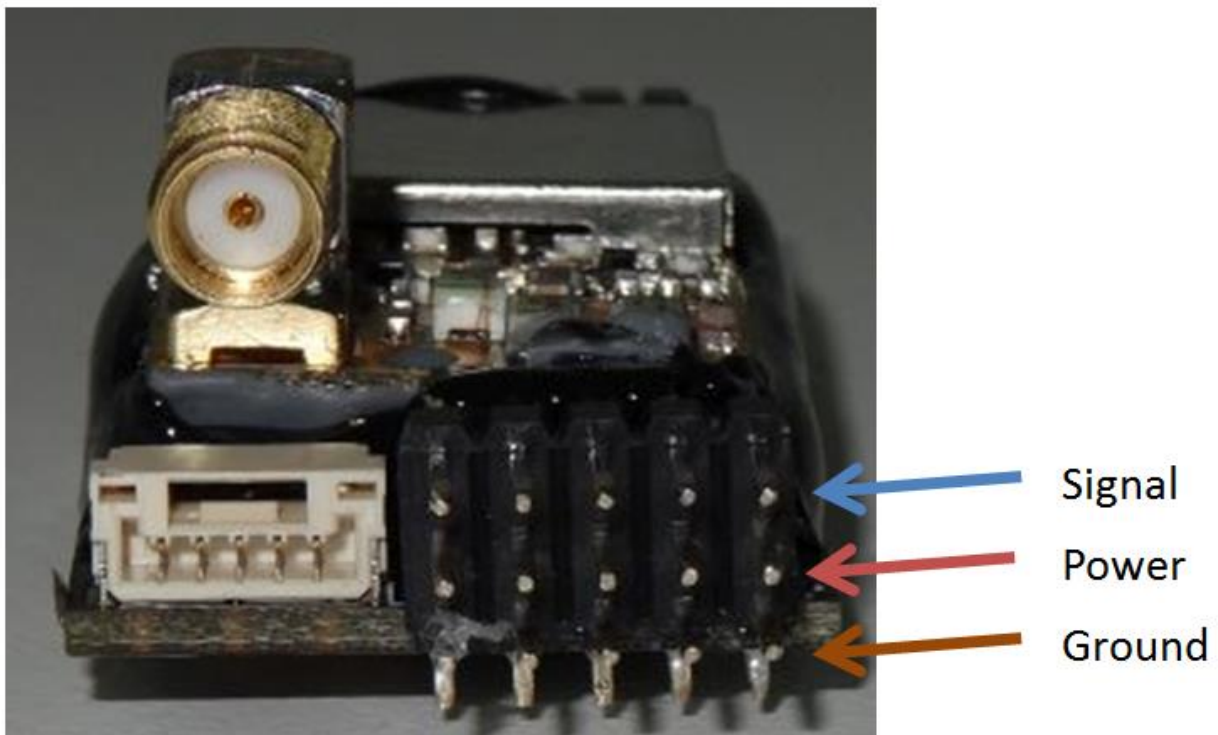
Bind/Menu Button

On the top of the DragonLink, you will find the Bind/Menu button. This button serves a number of purposes:

- Accessing the following LED menu features:
  - MicroPower Mode
  - Bind
  - Servo test
  - ID Change
- Putting the DragonLink RX into failsafe mode

When activated, the LED menu uses LED color changes to allow the user to tell which option is currently selected. When the button is released, the menu option corresponding to the color of the LED is accessed. In order to enter a particular menu option, hold the menu button, turn the DragonLink on, and keep holding the menu button until the LED glows the color associated with the menu option you wish to activate. Release the button and the DragonLink will enter the mode currently indicated by the LED.

The following list details the various menu options as well as their associated LED colors.

- MicroPower (Hold the button for at least 2 seconds, or until the LED turns GREEN)
  - Slow flashing between GREEN and OFF
  - *See the "MicroPower" section for more details*
- Bind (Hold the button until the LED turns YELLOW)
  - Fast flashing between YELLOW and OFF
  - *See the "Binding and Failsafe" section for more details.*
- Servo Test (Hold the button until the LED turns RED)
  - Flashing RED and GREEN
  - *See the "Servo Test" section for more details.*
- ID Change (Hold the button until the LED goes completely dark)
  - LED will remain completely dark.
  - *See the "ID Change" section for more details*

During normal operation, the bind/menu button may also be used to set the failsafe on the DragonLink RX. See the section titled "*Setting the Failsafe*" for more information.

PPM

The first step to your DragonLink setup is to obtain the PPM signal from your RC transmitter. This signal carries the servo position information for each channel sent from the RC transmitter. As few as one and as many as twelve servo channels can be sent to the DragonLink over PPM. Depending on the manufacturer of your radio, getting the PPM signal will differ slightly. Most RC transmitters allow the PPM stream to be accessed from their trainer port, however some require PPM to be obtained from the RF module connector.

Some RC transmitters have various options for how the PPM signal can be sent. Most commonly, the following options will be suitable for the DragonLink:

- PPM N or PPM P
- 22ms frame length

Futaba RC transmitters can utilize a anothert type of PPM timing. DragonLink refers to this as "MicroPPM" because the PPM frame rate shrinks from 22ms to 11ms. DragonLink fully supports MicroPPM automatically.

For detailed instructions of connecting your RC transmitter to the DragonLink transmitter, please see the following URL: http://www.dragonlinkstore.com/v2/node/9

Headtracker (HT) Configuration

The headtracker is a device designed to solve the problem of not being able to pan and tilt the camera on an FPV aircraft intuitively. Instead of using a spare set of channels on the RC transmitter, the pilot can use a set of video goggles and a headtracker to simply allow the airborne camera to pan or tilt whichever direction he or she looks. Headtrackers work by using a combination of a digital gyro and several other sensors to detect when a user has moved their head. Headtrackers are typically small boxes (or in some cases, exposed printed circuit boards) that are mounted on top of a hat or video goggles. Much like an RC transmitter, headtrackers output a similar PPM signal that the DragonLink can also process.

If you have a headtracker, the first thing you will want to do is connect it to the DragonLink **before** binding. The DragonLink does include the number of channels in the binding process to the RX, and it will add an extra two channels to the count of the RC transmitter if the headtracker is present. Thus, the headtracker must be connected before binding.

To electrically connect the headtracker, you will first need to attach power and ground. Depending on the model of the device, it may have a separate power jack, or power may be built into the main cable. The DragonLink does have a power output port on the headtracker power which can be used to forward the DragonLink's power supply to the headtracker as well. You will of course also need to connect the headtracker's ground to the DragonLink's ground. Finally, connect the signal wire to the signal pin on the DragonLink headtracker port.

The DragonLink is set up to detect the headtracker's pan and tilt output on the last two channels of the headtracker's PPM output. This means that if your HT has 8 channels, you will want to set it up so that it outputs pan and tilt on channels 7 and 8.

Once the headtracker is connected and the DragonLink is bound, the pan and tilt channels will be available on the two channels immediately following those belonging to the RC transmitter. EG; on a 6 channel transmitter, pan and tilt will be on channels 7 and 8 of the DragonLink RX.

The following HTs are tested with the DragonLink and known to work well, although in theory any headtracker that allows output on channels 6 and 7 should work fine:

- FatShark MIG (http://www.fatshark.com/migext.html)

Initial Power Up and LED Codes

Finally, this is the section where the DragonLink transmitter will be turned on and configured. First of all, you must double check all wiring. Make sure power and ground connections go where they need to be. If all looks correct, connect your choice of included antenna to the SMA port on the DragonLink. ***Do not power the DragonLink transmitter up without an antenna! This can cause permanent damage to your DragonLink TX.***

Once the antenna is attached, power on the headtracker, power on the RC transmitter and finally, power on the DragonLink transmitter. The DL TX will boot up, and in the process you will see several sequences of LED flashes followed by a flashing ED or solid GREEN LED.

If you get a GREEN LED, you have successfully performed the electrical setup of your DragonLink! Proceed to the next chapter in this guide.

If you do not get a GREEN LED, you may get one of the following:

- ■ A flashing RED LED:
    - o A RED flashing LED indicates that the DragonLink does not currently have a PPM signal.
    - o Check your wiring. Since the DragonLink did get a valid PPM stream at one time, a wire may be loose.
    - o Check your RC transmitter options. It may not be sending a valid PPM signal.
- ■ No lights at all
    - o If you get no light at all, the DragonLink is not getting power. Remember to ground the battery or power source to the correct pin on the DragonLink. If the DragonLink doesn't give you some kind of LED indication immediately after powerup, disconnect it and review your connections. ***Do not leave the power source connected if you do not get an LED almost immediately. You could increase your risk of letting a short circuit stay connected. Lipo batteries especially can catch fire under these circumstances.***

ID Change

The DragonLink uses a special ID to define the unique order in which it hops frequencies. This ID is shared between the transmitter and receiver and is programmed into the receiver during the binding process. The DragonLink transmitter has a built in function to update the ID with one that is randomly obtained. The following steps must be performed to activate this function:

1. Start with the DragonLink TX powered off.
2. Press and hold the bind/menu button on the top of the DragonLink TX.
3. Apply power to the DragonLink TX.
4. Wait. The LED will flash several sequences of colors. Continue holding the button down.
5. After around 20 seconds, the LED will turn totally dark.
6. Release the button, and power cycle the DragonLink TX.

If you were able to complete the steps listed above to obtain a dark LED, you have successfully changed the ID. Please note that after this process, the DragonLink must be power cycled and re-bound to the DragonLink receiver.

Binding

In this section, we will bind the RX to the TX. This process programs the RX so that it knows the ID of the TX it is intended to work with.

The following steps will **bind** the DragonLink TX and RX:

1. Start with both the DragonLink TX and RX powered off.
2. Press and hold the bind/menu button on the DragonLink TX.
3. While holding the button, turn the DragonLink TX on.
4. Wait until the LED turns YELLOW, then release the button.
5. The DragonLink's LED should now be flashing YELLOW. If it isn't, restart the process from step 1.
6. Power on the DragonLink RX.
7. The DragonLink RX's "status" LED will come on.
8. Power cycle the DragonLink TX.
9. As soon as the DragonLink TX comes on, the DragonLink RX's "status" LED should go dark.
10. Power cycle the DragonLink RX.

After power cycling the DragonLink pair, you should have RC control over the receiver. This can be tested by putting a servo on channel 1 of the DragonLink RX. On most RC transmitters, this will map to the throttle stick, which can be moved up and down to set the servo's position.

Servo Test

In this section, we will use the DragonLink's built in servo test mode to verify that the servos are able to move, regardless of the PPM signal which the RC transmitter is sending. This is useful for testing that the DragonLink is properly configured without worrying about making sure the RC transmitter is properly configured.

The following steps will enter **Servo Test** mode on the DragonLink TX:

1. Start with the DragonLink TX powered off
2. Press and hold the bind/menu button on the DragonLink TX.
3. Wait until the DragonLink TX's LED turns RED, then release the button
4. The DragonLink should be in Servo Test mode now.
5. When a bound RX is turned out, the servos attached to it will begin to move through their absolute maximum amount of travel.
6. When you are done verifying proper functioning of the servos, press the bind button to exit Servo Test, or power cycle the DragonLink TX.

Warning: Be extremely careful if you enter this mode with any kind of ESC/motor controller connected to the DragonLink RX. Because the servo channels are being moved through their full range of travel, any connected ESC may begin running at some point during the servo test.

Setting the Failsafe

This process will set the DragonLink RX's failsafe servo positions. The failsafe is a function of the RX that allows the servos to go to preset positions in the case of a signal failure.

Failsafe may be useful if you would like an autopilot (Return to home) or perhaps a lost aircraft beeper to activate during a signal loss. In order to do this, you must attach these devices to channels on the DragonLink that map to switches on the RC transmitter.

In addition to activating external electronics, you must also set the main flight control sticks to their failsafe positions. In the absence of an RTH (return to home) capable autopilot, you may want to set the sticks to a configuration where the throttle is pulled fully out, and the elevator stick is slightly forward in order to allow the aircraft to follow a rough glideslope to the ground in the case of a failsafe.

Failsafe stick/switch position data is stored on the DragonLink RX, not the TX. If the TX is powered off, it will take the DragonLink RX less than a single second to assume the failsafe positions.

The following steps will **set the failsafe** on the DragonLink RX:

1. Start with the DragonLink TX and RX on, as well as the RC transmitter. You must have a green light on the DragonLink TX, and a blue light on the DragonLink RX indicating a link before proceeding.
2. Put the sticks and switches into the configuration they must be in during a failsafe condition.
3. Press and hold the failsafe/menu button on the DragonLink TX for at least 5 seconds.

RF Output Power Levels

The DragonLink allows for three different RF power output modes:

- High power *(500mW)*
- Mid power *(250mW)*
- MicroPower *(Lowest power possible)*

The high power and mid power modes may be toggled using the switch on the top of the DragonLink case during normal flight operations. The intended purpose of switching RF power levels in flight is to allow the use of low power mode as a sort of safety net if you do not have access to the RSSI reading from the DragonLink. If, during flight, you begin to lose control of the aircraft, turn the switch the high power mode. You will regain control of the aircraft immediately, and you will now have an idea of the maximum distance that can be flown in this lower power mode. Please note that although the RF power output in low power mode is exactly half of the full output power, this does not mean that the range of the DragonLink will be halved in this mode.

The MicoPower mode is available as a replacement for the old method of range testing using dummy loads. With this mode running, the DragonLink may be range tested with all antennas attached as they would be under normal flight operations. In order to start the DragonLink in MicroPower mode, follow the following steps:

1. Start with the DragonLink TX powered off
2. Press and hold the bind/menu button on the top of the DragonLink TX
3. Apply power to the DragonLink TX
4. Wait. The LED will flash several sequences of colors.
5. Keep the button held down until you see the LED change to GREEN, then release.
6. The DragonLink TX is now running in MicroPower mode if the LED is slow flashing between GREEN and OFF
7. This mode will cause a failsafe on the receiver when it is positioned between 20 and 30ft from the transmitter.
8. ***DO NOT ATTEMPT TO FLY IN THIS MODE***. To exit MicroPower mode, power cycle the DragonLink TX.

Preflight and Range Check

Before flight, the DragonLink pair must be tested for proper communication at a reduced power level. This allows for the pilot to not only validate proper function of the DragonLink, but also for proper placing of the antenna. Either of these things can prove to be a critical factor in a crash if they are not properly checked before takeoff.

Although there is nothing that prevents the DragonLink from working consistently well across multiple flights, it is recommended that the DragonLink be preflight and range checked before all long range flight operations, as well as when the DragonLink is brand new, freshly installed in a new airplane or after the DragonLink has not flown for a prolonged period.

The following steps will preflight and range check the DragonLink

1. Check all cables and interconnects.
   a. All connectors should be snug
   b. The SMA antenna connectors should be smug, but not over tightened.
   c. Cables should be free from fraying, exposed conductors
   d. Verify all wires follow the connectors into their housing and there are no wires on the verge of removing themselves from secure crimps
2. Check that the antennas are connected on both the DragonLink TX and RX
3. Power the DragonLink on in *MicroPower Mode* (See previous section). Verify a flashing green light on the TX and blue light on the RX.
4. Walk off between 20 and 30ft holding the DragonLink transmitter as you go. If the aircraft is placed on a table, you should start to see a failsafe around 20-30ft. If the range before failsafe is much shorter than this, you have a problem with your configuration and you must check this before flight.
5. If you surpass this distance without a consistent failsafe, you are OK for flight.

Firmware Upgrades

Periodically, updates may be available for your DragonLink to improve performance or add features. While all DragonLink V1 units were required to be sent in for upgrades, the DragonLink V2 includes a secure, encrypted bootloader which allows for infield updates to be performed by the user using the DragonLink Serial Adapter and the DragonLink Updater Application.
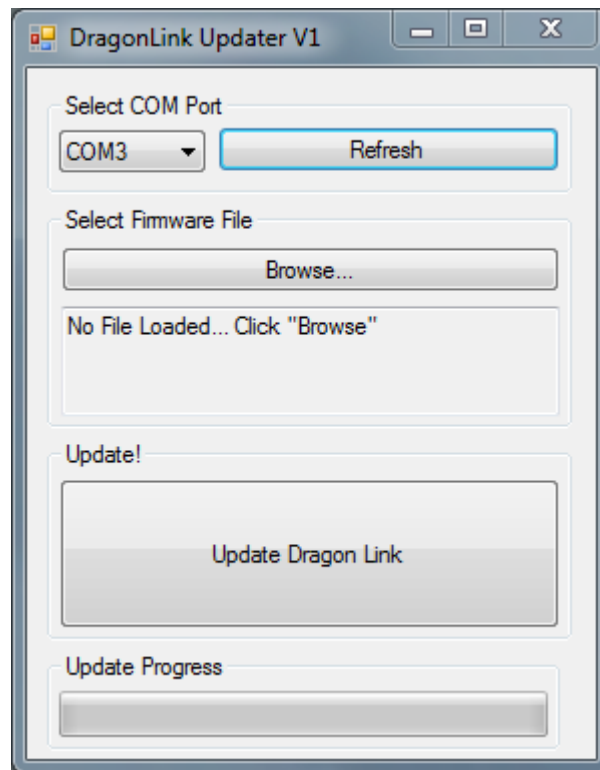
The steps below will illustrate how to perform a firmware upgrade on the DragonLink using Windows XP/7. These steps will work for the both the transmitter and receiver, however the transmitter and receiver will both use different cables, both included with the DragonLink Serial Adapter. Also note that there is a transmitter and receiver version for each flavor of firmware.

Before you begin, please download the DragonLink Update utility from [URL here], and have the version of firmware you intend to load, as well as the DragonLink Serial Adapter handy. When you have these items ready, please proceed to the directions below.

- Attach the DragonLink Serial Adapter to your computer
- Connect the included cable from the serial adapter to your DragonLink
- Power up the DragonLink

- From the zip file you downloaded containing the DragonLink Updater Utility, launch *DragonLinkUpdater.exe*
- Using the drop down menu in the Updater Utility, select the COM port which has been assigned to your DragonLink Serial Adapter
- Click on the "browse" button, and select the firmware file you would like to flash to the DragonLink. **Please note, there will be a different version of the firmware (ending in TX or RX) for the DragonLink TX and RX.**
- Click "Update". The progress bar will slowly advance and the upgrade will be finished within 10-20 seconds.
- Disconnect the DragonLink and power cycle it. **You must keep the exact same version number of firmware on both your DragonLink TX as is on the RX, so you may need to update the other half of your DragonLink pair if you have not already done so**