



Instruction Manual for the USB Flight Data Recorder²

Patent Pending

Document Version 2.2, Model # FDR-02



Thank you for your purchase! This instruction manual will guide you through the installation and operation of your Flight Data Recorder Version 2. ***Please read the entire manual carefully before proceeding.*** If, after you read the manual (including the Troubleshooting sections!) you have further questions or problems, see the Flight Support page on <http://www.eagletreesystems.com> for additional information, or email us at support@eagletreesystems.com. Please also fill out the registration form at the end of this manual if you did not purchase your Recorder directly from Eagle Tree Systems, so we can send you important update information.

Steps to Follow

Installation and use of the Flight Data Recorder will be quite easy and enjoyable if you follow these few steps:

1. Read through the manual to understand the warnings, determine what parameters you want to log, etc.
2. Install the Recorder in your model, as described in the Recorder Installation section below. Pay special attention to the polarity and plug-in location of the sensors, since some of the plugs will fit in more than one location!
3. Install and configure the Windows software as described in the Windows installation section below. Note that you will need to bring your model near your computer for this step.
4. Bench and range test your model, and have fun!

Intended Uses

The Flight Data Recorder System was designed for recreational use in Radio Controlled model airplanes and helicopters. Using the Recorder for other purposes is not supported. Further, using the Recorder in situations where its use or failure could result in loss of life, bodily injury or property damage is expressly prohibited.

Packing List

Your package should include the following: Flight Data Recorder, 4 'Y' Cables, 3 feet of Pitot Tube hose, plastic Pitot Tube extension, 1 Temperature Sensor, 1 RPM sensor, 4 tiny magnets, Custom USB Cable, CD-ROM, battery backup harness (use optional), and a printed version of this manual. Please see our website for updates to this manual if changes were made after printing.

Optional expanders for measuring G-Force, Exhaust Gas Temperature, Electric Motor Current/Voltage, and other parameters are available from Eagle Tree Systems.

Installation of the Recorder

WARNING: As always, it is very important that you range and function test your model on the ground once the Recorder is installed to ensure that there is no impact on your system.

Make sure that your "antenna down" operating range is within the manufacturer's specifications. See your Radio owner's manual for the correct procedure for your equipment. It is always best to do the range check

in the flying configuration, for example with the engine running. DO NOT FLY IF YOUR MODEL DOESN'T PASS THE RANGE CHECK!!

NOTE: The recorder's label has a handy color coded means of indicating the polarity of the various connectors. The red dots on the label, which are on only one side of the text corresponding to each input, indicate on which side of the plug the red wire should go.

Powering the Recorder and Connecting the Recorder to Your Aircraft's Servos and Receiver

First, determine if you wish to log servo positions. If you decide to log servo positions, you will be connecting the Recorder to your receiver via the 'Y' cables. In this configuration, the Recorder is powered from your receiver battery.

If you decide not to log servo positions, you can still power the Recorder from your receiver battery by connecting one of the Y cables from a spare receiver channel to the Recorder (or use your own 2-3 wire connector).

If you want to power the Recorder from a separate battery, meaning that you want complete electrical isolation between the Recorder and your receiver, you can power the Recorder with a small separate battery as described in the Installing Battery Backup Harness section below.

The Recorder includes four custom, heavy duty 'Y' cables with Universal connectors which install in line between your throttle, rudder, aileron and elevator servos and your radio receiver. Connection of the 'Y' cables is simple: connect the center (male) keyed connector of the 'Y' to one of the 4 keyed slots servo slots in the recorder (see Figure 1), connect the remaining male connector one of the channels on your receiver, and connect the female 'Y' connector to the servo which you previously connected to that channel of the receiver. Note: It doesn't matter which of the 4 keyed recorder slots you plug your 'Y' cables into – the Recorder Application will automatically detect which servos are connected where during application setup.

WARNING: Do not connect 'Y' cables to any other location on the recorder. Doing so may damage the recorder or other components.

Note: the Recorder, which draws only around 35 mA of current, draws power from the 'Y' cables. All standard receivers we are aware of hardwire the power and ground wires from the battery to the power and ground wires of the servos, so the Recorder is in reality directly connected to the battery.

Note: The 'Y' cables included should be compatible with most of the currently available receivers, such as Futaba™, JR™, Tower™, and HiTec™. The pinout of the 'Y' cables is as follows: Black = ground, Red = power, White = servo signal.

WARNING: It is your responsibility to make sure that your receiver and servos are pin compatible with the Y cables before connecting. Serious damage could result to your receiver, servo or recorder if they are not compatible.

Connecting the Airspeed Pitot Tube

The Recorder uses pressure differential via a Pitot Tube (a piece of small fuel tubing which you will fit with a short piece of plastic insert, supplied) to measure airspeed, just as full size planes do. The static port of the pitot sensor is located inside the Recorder.

The airspeed sensor is very sensitive and can be temporarily affected by close proximity to your transmitter's antenna. If you find significant variation in airspeed while on the ground near your receiver, read the Troubleshooting section below on how to address it.

The end of the Pitot Tube without the plastic insert is connected to the nipple through the small hole in the top of the Recorder, which is labeled "Speed."

To connect the hose, press the hose down over the nipple while rotating the tubing back and forth. Once it is on, tug it lightly to ensure it's well attached. Lightly moistening the end of the rubber tube can ease installation.

Cut off an approximately 1 inch piece of the supplied plastic insert, and insert it partway into the other end of the tube. Alternatively, you can use brass or other tubing of similar size. The pickup end of the Tube should be positioned somewhere on the plane where the mouth of the insert will be pointing toward the direction of the plane's travel, into the wind. It's important that the tube be placed so that it is not directly in the plane's prop-wash, which will result in erroneous readings. Some good places to install the tube are on the leading edge of the wing several inches out from the fuselage and out of the propwash, or on the landing gear.

For wing mounts, the tube can be mounted temporarily with Scotch tape, plumber's putty, or other, or for more permanent installations in new (or crashed) planes, it can be installed in a small hole drilled in the leading edge of the wing and the tube run inside the wing and into the fuselage.

WARNING: If you mount the Pitot Tube in such a way that it might induce drag on your model, you need to make sure that it won't cause the model to become unstable during flight!

It's important that the Pitot Tube's plastic insert is kept rigid and pointing directly into the wind (the direction of the plane's travel). For temporary installations, one simple way to do this is to apply a small lump of plumber's putty around the insert at the leading edge of the wing to keep it rigid.

For landing gear mounts, it may make mounting easier to replace the Tube's short plastic insert with the longer plastic insert, or you can purchase a length of brass tubing for more rigidity. Either can be bent into an 'L' shape and held in place with glue, zip-ties, or tape.

Our testing has shown that the length of the tube does not have a significant effect on airspeed measurement, so it should be no problem to lengthen or shorten the supplied tube. We have also received reports that changing the plastic insert with metal or other rigid tubing also does not affect airspeed measurement.

NOTE: It is of course not necessary to use the Pitot Tube with the Recorder if you are not interested in measuring airspeed – the other functions of the Recorder will work without airspeed readings.

NOTE: Additional Pitot Tube kits are available for purchase on our website.

Installing the Temperature Sensor(s)

One temperature sensor is included with the Recorder – an additional sensor can be ordered separately. The temperature sensors are typically installed by placing the black wire loop around the cylinder head, and cinching it in place by pulling the two rubber stays snugly against the engine. Normally the highest temperatures are experienced near the base of the engine, but experience will dictate where your particular engine best reads heat. Other mounting arrangements are possible, such as obtaining a metal washer with a tab, carefully bending the tab around the sensor portion of the wire loop, and installing the washer under your glow plug, or installing the sensor under a dedicated tapped screw in the cylinder head. Note that since various mounting locations and brands of temperature devices on the market will read differently, the most important aspect of temperature measurement is learning how your engine reads under various conditions, and adjusting based on relative temperature readings. Plug the Futaba style connector from the sensor into the recorder as shown in Figure 1.

Note: the Temperature Sensor lead can be easily extended with a standard servo extension cable.

Installing the RPM Sensor

Installing the RPM sensor and magnets is the most challenging part of installation, but is relatively easy once a good mounting location is determined. Refer to our website's Flight support page at <http://www.eagletreesystems.com> for pictures of example installations.

To install our magnets, first find a suitable location on your engine's motor to attach either one or two small magnets and RPM sensor. Typically, the prop washer or prop hub are ideal locations. This will of course vary with make and model of plane. Make sure the magnets are mounted on some structure that doesn't "flop around," as the magnets could hit the sensor in this case. The RPM sensor must be mounted so that it does not move around, and is within 1-2 mm of the two magnets as they spin. On typical plane installations, there's usually a place where the back of the sensor can be glued to a flat surface under or over the hub which has the magnets mounted. The Recorder kit includes four magnets. That provides you with up to 3 spares.

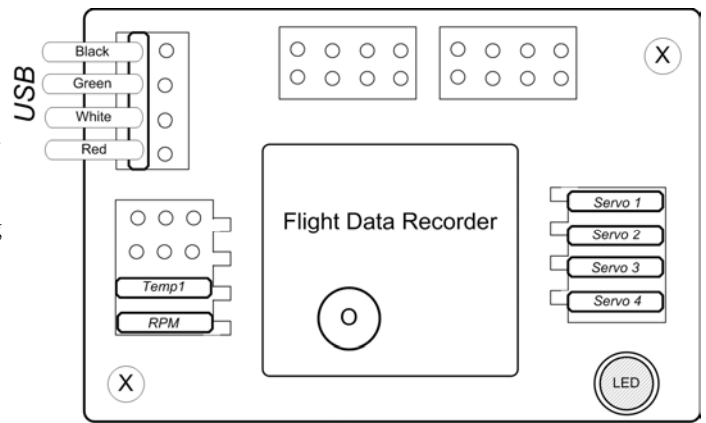


Figure 1

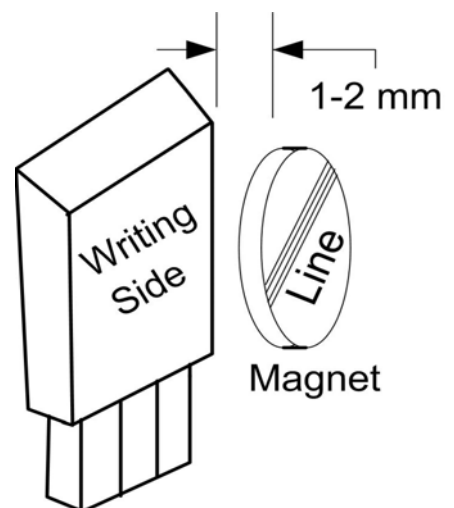


Figure 2: RPM Sensor & Magnet

Note: if your engine already has magnets mounted for some other purpose, there's a good chance you can use them. Take one of the magnets included with your recorder, and put that magnet up against the previously mounted magnet. If the red line of the Recorder magnet faces down so that the sensor can be mounted facing the side of the magnet with no red line, mount the sensor with the printed side toward the magnet. If the side of the magnet with the red line is visible when on top of the previous magnet, the polarity is reversed. This should work correctly if you install our sensor backwards (printed side of sensor away from magnets), though we have not tried it.

We are often asked whether existing magnets on spark ignition engines can be used. The answer is "yes" in most cases, if you can install the sensor near enough to rotating magnets. We have found that these engines typically have 3 magnets, with 2 magnets mounted with one polarity, and the other one with another polarity. The easiest way to use these magnets is to install the sensor with the printed side facing the magnets (as described below) then run the motor and see what RPMs are recorded after setting up the gear ratio. If the RPM looks like it is only half of the correct value, double the gear ratio value you entered, to compensate for only one magnet being in the right polarity.

Once you have determined where to install the magnets, decide whether you will drill a hole so that the magnets will mount flush with the surface, or if you will just glue the magnets to the surface. Though somewhat more difficult and permanent, mounting the magnet flush with the surface is the best long term approach, since the mounting will be much more rugged, and the risk of imbalance due to not mounting the magnets exactly 180 degrees apart is reduced. In fact, if the magnet is mounted flush in another metal material, it is quite possible that no shaft imbalance will occur if you only mount one of the magnets total. If you decide to use only one magnet, make sure you change the gear ratio to "2" on the Calibrate Motor RPM page under the Tools menu in the app.

To flush mount the magnets, drill a hole just slightly larger than the diameter of the magnet size you choose, and of the same depth as that magnet. If you decide to surface mount the magnets, thoroughly clean this area and lightly scuff it to improve adhesion. Glue the magnets **with the side marked with a red line facing inward (hidden)**, using epoxy, or other strong, suitable glue. It's important that the red line on the magnets faces away from the sensor once the sensor is installed. The magnets should be glued 180 degrees apart to keep the shaft in balance.

WARNING: make sure that the magnets are glued sufficiently so that they will not detach and create a hazard, and always wear safety glasses when your engine is running!

Once the magnets are glued and completely dry, temporarily position the RPM sensor so that **the side of the sensor with printing is facing the side of the magnets WITHOUT the red line**. The sensor now needs to be glued so that it is held rigidly into position. Before gluing, put a small spacer (1-2 mm thick) between the sensor and one of the magnets to ensure proper spacing. If necessary, a stiff piece of wire, such as a paper clip, can be glued to the back of the sensor to increase its stability.

After the sensor is glued and completely dry, remove the small spacer and rotate the propeller to ensure complete freedom of movement. Also make sure that the sensor won't vibrate and come in contact with the magnets during driving. If this happens, the sensor will be destroyed, and the Recorder could be damaged.

Once these steps are complete, plug the Futaba style connector on the sensor into the recorder as shown in figure 1. Note that a standard Futaba style servo extension cable can be used to lengthen the wire if needed.

Altitude Measurement

The Recorder measures altitude via a sensor inside the unit. Altimeters measure slight pressure differences to determine elevation. Since these pressure differences are relatively small, it's important that the airplane's internal pressure doesn't vary much due to propwash or moving through the air. Such variation can occur if the front portion of the plane has an opening that causes air to compress inside of the plane when air is forced into this opening. If you have a problem with inconsistent altitude measurements and you think your plane may not be airtight up front, see the Troubleshooting section at the bottom.

Also, the altimeter is sensitive and can be temporarily affected by close proximity to your transmitter's antenna. If you find significant variation in altitude while on the ground near your receiver, read the Troubleshooting section below on how to address it.

Installing the Battery Backup Harness (optional)

In most cases, the Recorder can be successfully powered by the Y cables from the receiver. If you have problems with recorder power during acceleration or steering, as described in the troubleshooting section, this can be remedied by adding a small backup battery to power the recorder. To add the backup battery, plug the larger end of the backup harness into the recorder. The backup harness is the two wire cable with a Futaba style male connector on one end, and a larger male connector on the other end. The

large end of the backup harness plugs into the USB port of the recorder, with the red wire in the same place as the red wire of the USB cable (as shown in the drawing).

The backup battery must be at least 4.5volts to power the recorder. Power is only drawn from the backup battery when the voltage being supplied through the Y cables drops below the voltage of the backup battery, so if you use a 4.5 volt backup battery, no power should be drawn from it except for moments when the main battery drops below this voltage. Therefore, it is possible to use a very small pack (a tiny 4 cell lithium pack or possibly 3 watch type batteries) as the backup battery. Note of course that the backup battery must be disconnected whenever the receiver is turned off, as it will power the recorder whenever power is not supplied to the recorder from the receiver. If you want to get fancy, you could add a DPDT switch in place of the standard receiver switch and turn off the backup battery whenever you turn off the receiver.

Removing the Recorder from your Plane

When you remove the Recorder, your servos are still connected to your receiver so it's not necessary to remove the 'Y' cables from the plane to operate it without the Recorder. Be sure however that the connectors are kept from shorting.

Note: Additional 'Y' cables, RPM sensors and temperature sensors are available for purchase on our website if you wish to install and leave 'Y' cables in more than one plane. This makes it very easy to use the same recorder with multiple Flights.

Also, there is an external hookup kit available from Eagle Tree Systems which extends the USB, pushbutton and LED to the outside of your plane. This allows for easy downloading and control of the Recorder without removing the canopy or wing.

Installing and Using the Windows™ Application

Installing the Windows Application

The supplied Windows application is compatible with USB equipped PCs running Windows 98SE, Millennium, Win 2K, and Win XP. The application is not compatible with Windows 98 Original Edition (Gold), or NT 4, even if the PC has USB support.

NOTE: the application included on CD with the unit was current at the time of manufacture. Please check our Flight Support page on <http://eagletreesystems.com> to see if there is a newer version of the app which may have addressed issues you could encounter.

To install the application, just place the CD in the CD-ROM drive. If AutoPlay is enabled on your PC, the setup program should run automatically. If it does not run, click on My Computer, click on the icon for your CD-ROM drive, and click on the "Flight Data Recorder" application icon in the drive window.

Follow the Setup Wizard to install the Recorder application. Once installation is complete, the Recorder may be launched either from its Desktop Icon, or by choosing the Recorder application from the *Start->Programs->Eagle Tree Systems* folder.

Setting up the Recorder with the Application

Once the application is installed, follow the above steps to launch it. The first time the application is launched, the New Model Wizard will be invoked.

The Wizard will prompt you to install the Recorder using the supplied USB cable.

Warning: Make sure you connect the custom USB plug with the correct polarity, and into the correct connector on the Recorder, as shown in Figure 1. Not doing this could cause damage!

When you do this for the first time, the behavior will be different depending on which version of Windows you are using:

Windows 98™: The Recorder and application are **not** compatible with Windows 98.

Windows 98SE™ and Windows Millennium™: When the Recorder is first connected to the USB port, the New Hardware Wizard will likely appear. Follow the steps in the Wizard, choosing the options to allow Windows to find the appropriate drivers for the Recorder – these drivers are built into Windows. If the devices you already have on your computer haven't required the installation of the USB drivers, Windows will prompt you for your Windows CD to copy over the drivers. Once this process is complete, you

may be asked to reboot the system. Reboot at this point, then relaunch the Recorder Application, and the New Flight Wizard should start up again.

Windows 2000™ and Windows XP™: When the Recorder is first connected to the USB port, Windows should automatically install the correct drivers without prompting you. If you should receive a Windows prompt, however, do what it says.

Once the Recorder is correctly discovered and installed by Windows, continue on with the New Flight Wizard, relaunching the app after reboot if necessary.

Telling the Recorder what to Log

The first time you run the app, you will be prompted to choose what driving parameters you wish to log. The more items you log, the less record time will be available. A description of the parameters is below:

Servo movements: If one or more of these parameters is checked, the recorder will log the positions of the corresponding servos. Choose these options if you want to see controller movements during your flight, etc. .

Receiver Battery Voltage: Selecting this parameter causes the recorder to log your receiver's battery voltage (or whatever battery is being used to power the servos). Note that it is normal to see rapid spikes in the receiver battery voltage on playback, but if you are seeing voltage drops below 4.5 volts on a regular basis, you should test your battery. The Recorder constantly monitors battery voltage even if this option is not checked, and will shut itself down if the battery voltage consistently is below around 4.5 volts to save power for the receiver. The recorder will log an error in this case. The recorder will "reboot" if the voltage falls below 4.35 volts even for a short period, and logs an error in this case also. Error logs are displayed in the "Notification Area" of the application during playback.

Servo Glitches: If this option is selected, the recorder detects and logs three different types of servo glitches: short servo pulses (less than 740uSec), long servo pulses (greater than 2.25 mSec) and missing servo pulses (no pulse for 100mSec). The most common causes of glitches are low receiver or transmitter battery, driving out of range of your transmitter, or defective receiver. Note that it is normal to see a series of glitch notifications right after the recorder or the transmitter is powered up.

Speed: If this option is selected, the recorder logs the speed of your plane via the air pitot tube.

Altitude: If this option is selected, the recorder logs the flight's altitude with each sample.

RPM: If this option is selected, the recorder logs the RPM of your Flight.

Temperature 1: Choose this option if you want to record temperature from the supplied temperature sensor.

Temperature 2: Choose this option if you want to record temperature from one additional temperature sensor, sold separately.

Optional Accessories: See the instruction manuals included with the optional accessories for information on logging these parameters. Optional expanders for measuring G-Force, Exhaust Gas Temperature, Electric Motor Current/Voltage, and other parameters are available from Eagle Tree Systems.

Setting the Joystick Configuration Mode

The Recorder application defaults to US Mode 2 Joystick configuration, which is:

- Left Joystick controls throttle and rudder, and Right Joystick controls elevator and ailerons.

If you desire, you can select US Mode 1 via the Tools->Set Joystick Configuration Mode. Mode 1 is:

- Left Joystick controls elevator and rudder, and Right Joystick controls throttle and ailerons.

Setting the "Stop on Full" Feature

After you complete the New Model Wizard for the first time, you will be prompted to choose whether you want the recorder to write over its data when its buffer becomes full, or to stop when the Recorder is full. NOTE: You can change this setting later from the Tools menu.

Setting the “Set Capture Rate” Feature

The Recorder can be adjusted to capture data in during flight at five different rates. The faster the capture rate, the more data is obtained, but at the expense of record time. The default rate, four samples/second, gives good resolution and reasonable record times. You may find that you can get plenty of record time even with the highest capture rate setting, however.

A note on record time: The recorder uses advanced data compression to get the most data recorded as possible. When your plane is sitting idle before or after flying with the battery turned on, the recorder is still capturing data, but since not much is changing very little data is recorded. But when the plane is actively being flown lots of data is being recorded.

Note: You can change this setting later from the Tools menu.

Setting the “Choose What to Display” Feature

The Recorder Application can display several flight parameters in both numeric and instrument format. Select the parameters you wish the Application to display with this dialog box. Note that some of the parameters require optional accessories, available from Eagle Tree Systems. Also note that the display area is limited, so not all parameters can be displayed at once. Numeric parameters take up less space than instruments, so more numeric parameters can be displayed at once.

Note: Select the “Metric” checkbox on this dialog if you want metric operation. Also, you can change this setting later from the Tools menu.

Setting the RPM to Motor Revolutions Parameter

For the Recorder Application to correctly determine the RPM of your motor, you must tell the application how the rotation of the motor relates to the rotation of the magnets. The first time you run the app, you will be prompted to enter this information.

Enter the number of times your motor turns with each rotation of the magnets as described in this dialog box.

Note: You can change this setting later from the Tools menu.

Using the Recorder

Once the Recorder and application is installed, it’s almost time to fly! Please read the important information below on Recorder operation before using it in your plane.

The Recorder’s LED

The Recorder’s LED serves several purposes. When the Recorder is powered on when installed in your Flight, the LED flashes a number of times to indicate your 4.8 or 6 volt battery’s charge state at power-up time. Five flashes indicates a fully charged battery, and three or fewer flashes indicates that the battery is likely not safe to use. Loading can affect these readings, of course.

IMPORTANT: The Recorder’s battery indicator should be used as a guide only: you need to verify that the LED gives accurate results with your system, and you need to make sure that your battery’s charge state is sufficient before flying under the appropriate loads.

WARNING: The Recorder gives charge level indication for both 6 volt and 4.8 volt batteries, and attempts to detect which is installed automatically.

Be aware that if you have installed a 6 volt battery and it goes so dead that it looks like a fully charged 4.8 volt battery, the Recorder will flash five times because it thinks the battery is fully charged, though the 6 volt battery is actually nearly dead!!

Once the Recorder is powered up in your Flight, it will either flash one or two times every second or so. This flash rate is longer or shorter depending on the capture rate. This flashing indicates the following:

One Flash - The recorder is actively recording. This is the normal power-up state.

Two Flashes – The recorder is paused. This has happened either because the Recorder’s data buffer is full and you have selected the “stop on full” mode described above, or you have manually paused the Recorder as described below in the Recorder Button section.

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Three Flashes – The Recorder is connected to your PC's USB connector, and has been recognized by the PC.

The Recorder's Pushbutton

The small red pushbutton on the Recorder serves two purposes.

When depressed and released quickly, the button toggles between Pause and Record modes. The LED will indicate the current mode as described above.

When the button is depressed and held in for several seconds, the LED will flash rapidly, the Recorder's Data Buffer will be cleared, and the Recorder will flash to indicate battery voltage as described above.

NOTE: All data within the Recorder will be lost when the Recorder is reset in this manner!

After You've Flown

After flying with the Recorder, you can either remove the Recorder from your plane and take it to your PC, bring the plane with the Recorder still in it to your PC, or (if you're lucky) use a Laptop and connect to the Recorder in the field.

After you connect the Recorder to your PC's USB interface, the LED should indicate USB connectivity with three repeating flashes as described above.

Once the Recorder is connected, launch the Application and click on the Download From Recorder button. This will load the Recorder's Data Buffer into the Application for playback and saving.

Use the play controls to play back the data. Note that the Slider can be dragged with the mouse by clicking and holding it then moving it to the desired position.

The application displays the following information:

- ***Notifications*** – this window displays messages about the flight. The three most common messages are:
 - Startup/Reset Detected – this indicates that the Recorder has been turned on at the time specified
 - Recorder low battery restart – this indicates that the Recorder has 'rebooted' because the power momentarily dropped below 4.35 volts. See the troubleshooting section if you frequently see this message.
 - Glitch detected – these messages tell you what type of glitch was detected, and on what servo the glitch occurred. The most common causes of glitches are low receiver or transmitter battery, flying out of range of your transmitter, or defective receiver. Note that it is normal to see a series of glitch notifications right after the recorder or the transmitter is powered up.
- ***Length/Progress*** – when stopped, this readout indicates the total recording length. When playing back, this meter indicates current time into the flight.
- ***Battery Voltage*** – this instrument indicates the current battery voltage during playback.
- ***Graphical and/or Numeric Temperatures*** – The application can display up to two Temperature readings in either instrument or numeric format.
- ***Graphical and/or Numeric RPM*** – The application displays RPM readings in either instrument or numeric format.
- ***Graphical Joysticks*** – Joystick positions are indicated via graphical joysticks.
- ***Graphical and/or Numeric Speed*** – The plane's speed, as computed from the air pitot tube can be displayed graphically and numerically.
- ***Graphical and/or Numeric Altitude*** – The plane's altitude is displayed when these options are selected.

Other display options are available with optional equipment from Eagle Tree Systems.

A note on Multiple Flights

Depending on the length of your flights, it is often possible to record multiple flights into the recorder without having to clear the buffer or overwrite data. Playback of multiple flights can be a little confusing. One thing that helps you to separate runs is the "Recorder Startup" message that displays in the notification area. Whenever this displays, the recorder has been powered down and turned back on. If you turn off and on your receiver between flights then you can know when one flight ends and the next one begins.

Saving Flight Files

After downloading flight data, if you wish to save the data to play back later or to share with friends, save the file with the File->Save Recorder File menu. Note that the file is saved with a .FDR extension by default.

Graphing/Spreadsheet Compatibility

The Recorder application has extensive graphing capability built in. Just click on “Graph Data!” on the toolbar to graph loaded data. Click on the HELP button on the graphing page for more information on graphing.

Also, the Recorder’s Data File is compatible with Excel™ spreadsheet software, and perhaps other spreadsheet brands. Using Excel™ is useful for graphing the data output from the recorder.

To load in Excel, save the data file from File->Save Recorder File, and in Excel™ choose File->Open, and select “All Files” in the “Files of Type” box. Navigate the Excel dialog box to the location you saved the .FDR data file, and click on the filename. Excel should then bring up the “Text Import Wizard”. Choose the “Delimited” option, and on the next page choose “Delimited with Spaces”. The data should then load correctly in Excel.

The format of each line of data in the file is:

First Line: Plane Name

Second Line: Data about your plane’s setup. This line is needed to allow sharing of your flight files with others.

Third line: header indicating what each of the fields represents. These columns are:

*Aileron Elevator Throttle Rudder Altitude RPM Speed Rec-Bat*10 Temp1*10 Temp2*10 Amps*100
PackVolt*100 GForceX GForceY ThermoA ThermoB IsEvent EventError EventData Timestamp*

The first four entries indicate servo positions. The values correspond with the length of the servo pulse for each servo. A lower # means the pulse was shorter. A value of zero corresponds to a length of about 740uSec, and a value of 254 means about 2.25mSec.

If IsEvent is 1, the record contains event data as well as regular data. Typical events are power-up (restart), and servo glitches. Ignore the non-event fields when IsEvent is set to 1.

Event Codes in the “EventCode” field are as follows (the first one is 0). Note that “internal” errors should be reported to Eagle Tree Systems:

ERROR_BEGINPOINTER_INVALID - internal,
 ERROR_ENDPOINTER_INVALID - internal,
 ERROR_INIT_POINTERS_INVALID - internal,
 ERROR_INITIALIZE_FAILED - internal,
 ERROR_CANT_SEND_HEADER - internal,
 ERROR_CANT_SEND_ANALOG_PACKET - internal,
 ERROR_CANT_SEND_DATA_PACKET - internal,
 ERROR_BATTERY_LOW – battery has fallen below a safe level for an extended period of time,
 ERROR_BATTERY_DEAD – battery has fallen below a critical level for an extended period of time – recorder will shut itself down in this case,
 ERROR_RESTART – the recorder has been restarted normally,
 ERROR_NESTED_INT_DISABLE - internal,
 ERROR_ILLEGAL_INT - internal,
 ERROR_LOW_BAT_RESTART – the recorder has been restarted due to a brownout,
 ERROR_SERVO_GLITCH_MISSED – a servo pulse was missing,
 ERROR_SERVO_GLITCH_SHORT – a servo pulse was shorter than 740uSec,
 ERROR_SERVO_GLITCH_LONG – a servo pulse was longer than 2.25mSec,

Timestamp indicates when each record was collected. The timestamp is in milliseconds.

Email us if you need more information on the file format.

Happy Flying!!

Troubleshooting

Below is a list of problems that may be encountered, and steps to remedy them. If your particular issue is not addressed by the below, see the Flight Support page on <http://www.eagletreesystems.com> or email info@eagletreesystems.com. Include a full

description of your problem, your machine configuration, brands/models of receivers, transmitters and servos, application and Recorder firmware version if possible (from Help->About in the app) and any other relevant details.

Issue: My PC does not recognize the Recorder.

Solution: Try to eliminate the problem in the following ways:

- Disconnect all other USB peripherals from your PC (if possible) and try the Recorder again.
- Try the Recorder on a different PC. If it works, there may be a misconfiguration with your PC.
- Try the Recorder with a different USB cable, if you have one. If this works, your cable has been damaged.
- Try rebooting your PC – occasionally USB support gets disabled with some PCs.
- Try the other USB connector on your PC if it has two.
- Ensure that USB is enabled within your Operating System by checking in Device Manager. You'll need to see your Windows™ documentation to determine how to do this on your particular OS version.

Issue: I am seeing servo jitter or observing reduced range during range checking, after installing the Recorder and sensors.

Solution:

Chances are that RF interference is being channeled from your engine or other noise source, through your recorder, and to your receiver. Spark ignition engines have more of a problem with this than nitro or electric, due to the RFI generated by the ignition circuitry. Never fly if your plane can't pass a range check!! There are a few possibilities to remedy this.

- Ferrite cores can often be used to filter out the RF interference. Snap-on RF ferrite cores are available from Eagle Tree Systems, Radio Shack or other sources. Often a single ferrite snapped around all the wires leading from the engine will eliminate this problem.
- If a single ferrite does not remedy the situation, an additional ferrite snapped around all the servo Y cables provides additional filtering.
- If ferrites do not correct the problem, it may be necessary to disconnect the Y cables from your recorder, and not record servo positions. This would be an extreme case, however. Note that if you have to take this step, it is necessary to power the recorder from a separate backup battery as described below.

Issue: RPM is not working correctly

Solutions:

- Make sure you have the writing on the RPM sensor facing away from the red lined side of the magnets.
- Make sure that under Choose What to Log in the app, you have checked RPM.
- Make sure that the RPM sensor is plugged into the correct slot on the recorder (should be the bottom slot next to the temp sensors).
- Connect the recorder to the computer and launch the app. Then, choose Tools->Live Mode. Make sure that the RPM gauge is displayed, and spin the magnets, or wave the magnets by hand in front of the sensor. Try both sides of the magnets and both sides of the sensor. See if the RPM reading jumps. If it does not, email support@eagletreesystems.com.

Issue: My plane shows an airspeed or variation during warm-up on the ground as I rev the throttle.

Solution: In some installations, RF from the transmitter can interfere with the altitude and airspeed measurements when the plane is very near the transmitter. Possible solutions are to keep the antenna down when near the plane (if this is safe with your setup), or to just ignore altitude and airspeed data when the plane is very near the transmitter. If neither of these solutions is practical, snap-on RF ferrite cores are available from Eagle Tree Systems, Radio Shack or other sources.

We've found that snapping these on the wires going into the recorder as close to the recorder as possible virtually eliminates any interference. Normally two cores would be required to get all the wires.

Solution: This problem will happen when the Pitot Tube's opening is being hit by prop-wash. The solution is to move the tube farther away from prop airflow. Note that slight variations in speed (and even a reading of around 9 MPH, which is the lowest speed detectable, when the plane is stationary) is normal.

Issue: The recorder seems to stop recording mid-flight.

Solution: The recorder shuts off if it detects a very low battery for an extended period of time. Download the flight data, and if you see the battery voltage is below 4.5 volts constantly, the recorder likely shut off. Charge or replace your battery, or install the optional battery backup harness with a small backup battery. Also, if you have the recorder set up to pause when its buffer is full, and the buffer becomes full during flight, the recorder will stop recording.

Issue: I have a fully charged battery, but the recorder frequently shows "Low Battery Restart" Notifications when playing back data.

Solution: The recorder shuts down immediately if the power goes below 4.35 volts for more than a few milliseconds, and logs this occurrence when the power returns to above 4.35 volts. If your battery's voltage frequently drops this low, you may be underpowered, and may want to consider getting a bigger battery. It is however not too unusual for this to happen with 4 cell packs and some servos with acrobatic flying. If this becomes a significant problem, it can be eliminated by moving to a 5 cell pack or adding a secondary battery with the backup battery harness as described above.

Issue: My plane's altitude reading varies during warm-up on the ground, or when taxiing on the ground.

Solution: Slight variation is normal. Also, in some cases when the Transmitter's antenna is fully extended and very near (within a foot or two) of the recorder, the altimeter's reading can be significantly affected. Possible solutions are to keep the antenna down when near the plane (if this is safe with your setup), or to just ignore altitude and airspeed data when the plane is very near the transmitter. If neither of these solutions is practical, snap-on RF cores are available from Eagle Tree Systems, Radio Shack or other sources. We've found that snapping these on the wires going into the recorder as close to the recorder as possible virtually eliminates any interference.

If you get lots of variation when revving the throttle, check to see if there are openings in the front of your plane that allow air to enter and increase pressure inside the fuselage.

If your plane is not airtight or at least sealed well up front, you may have this issue, since the altimeter measures changes in air pressure. If you have this problem and want very accurate altitude measurements, run a tube from the recorder's altimeter port to the outside of your plane following these instructions:

1. Remove the Recorder's case top.
2. There is a predrilled hole to accommodate an external altitude tube. Look at the back of your recorder cover, and use an x-acto knife to cut the label around the hole.
3. You can now install the external altimeter tube to the nipple of the altimeter sensor just like you do the pitot tube for airspeed. This tube should run out to the side or back of the plane, and should point perpendicularly to the direction of travel. It should also be rigidly installed so that the tip doesn't flap around. You can use a piece of the extra pitot plastic tubing that was included with your unit.

Flight Data Recorder Specifications

Airspeed: around 9 MPH minimum, approximately 290 MPH maximum

Altitude: 0 to approximately 32000 feet, in approximately 6 foot increments

Operational Voltage: 4.35V to 7.0V

Current Draw: < 35 mA @ 4.8 V

Weight: Recorder, 4 Y cables, RPM and temp sensors, and Pitot tube, approximately 1.5 oz.

Temperature: Dual inputs, 0 degrees F to 424 degrees F

RPM range: approx 100 RPM to 40,000+ RPM

Units supported: English and Metric

Measurements: 1.97" x 1.38" x 0.67"

Record Time: Varies with sample rate, parameters being recorded, and "activeness" of flight. Anywhere from around 8 minutes to hours is attainable depending on these settings.

Limited Warranty

Eagle Tree Systems, LLC, warrants the Flight Data Recorder to be free from defects in materials and workmanship for a period of one (1) year from the date of original purchase. This warranty is nontransferable. If your unit requires warranty service during this period, we will replace or repair it at our option. Shipping cost to us is your responsibility.

To obtain warranty service, contact us by phone, fax or email to request an RMA number. No returns will be accepted without this number.

This limited warranty does not cover:

- The Software included with the Flight Data Recorder. See the Software license agreement for more information on Software restrictions.
- Problems that result from:
 - External causes such as accident, abuse, misuse, or problems with electrical power
 - Servicing not authorized by us
 - Usage that is not in accordance with product instructions
 - Failure to follow the product instructions

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE (OR JURISDICTION TO JURISDICTION). OUR RESPONSIBILITY FOR MALFUNCTIONS AND DEFECTS IN HARDWARE IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS WARRANTY STATEMENT. ALL EXPRESS AND IMPLIED WARRANTIES FOR THE PRODUCT, INCLUDING, BUT NOT LIMITED TO,

ANY IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN TIME TO THE TERM OF THE LIMITED WARRANTY PERIOD AS DESCRIBED ABOVE. NO WARRANTIES, WHETHER EXPRESS OR IMPLIED, WILL APPLY AFTER THE LIMITED WARRANTY PERIOD HAS EXPIRED. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THIS LIMITATION MAY NOT APPLY TO YOU.

WE DO NOT ACCEPT LIABILITY BEYOND THE REMEDIES PROVIDED FOR IN THIS LIMITED WARRANTY OR FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, ANY LIABILITY FOR THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES, FOR PRODUCTS NOT BEING AVAILABLE FOR USE, OR FOR LOST DATA OR LOST SOFTWARE. OUR LIABILITY WILL BE NO MORE THAN THE AMOUNT YOU PAID FOR THE PRODUCT THAT IS THE SUBJECT OF A CLAIM. THIS IS THE MAXIMUM AMOUNT FOR WHICH WE ARE RESPONSIBLE.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Product Warranty Registration

Registering your product means that we can send you important updates and other notifications. Please fill out this form (or a copy) and mail or fax it to Eagle Tree Systems. Or, email the info to sales@eagletreesystems.com. Note that if you purchased your item directly from Eagle Tree Systems, this is not necessary.

Eagle Tree Systems Warranty Product Registration:	
Name:	_____
Address:	_____
Phone:	_____
Email:	_____
Product(s) Purchased:	_____
Date Purchased:	_____
Where did you purchase your product?	_____
Where did you hear about our product?	_____
Any features or additions you would like to see?	_____