9XR Pro: First Steps with Ersky9x

Welcome to Ersky9x on the 9XR Pro

Congratulations on your new Turnigy 9X Pro. We assume you've installed an appropriate module and have a matching receiver. Also, that the radio has a suitable battery and is fully charged. For help with these issues, please see the manual *9XR: Introduction to the Hardware*.

You may have read about the great programming power of this radio, but right now you just want to get flying. The aim of this guide is to help you do just that. We'll take you from programming the simplest possible four channel setup to adding a few basic improvements such as expo and dual rate. Then we'll outline some of the further possibilities you may want to explore, including various kinds of mixing.

At that point, you'll need more detailed and advanced guidance, and we'll point you to some of the other manuals about the transmitter and its programming, notably *9XR: Ersky9x Explained*.

Note that if you have used a regular 9XR transmitter with the stock firmware or with an upgrade to ER9x or Open9x, much of this should be familiar. But please read it anyway, as the Ersky9x firmware used by the 9XR Pro has significant differences and there are many, many features.

Enough preliminaries. Let's set up the radio to go flying with a really simple model.

Getting Started with the 9XR Pro

Preliminaries: Radio Setup

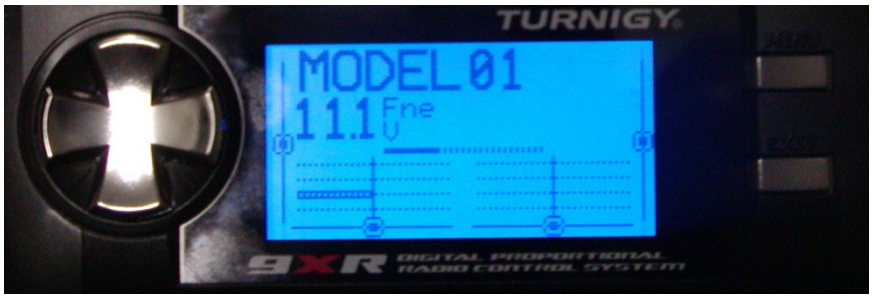
Before we actually set up a model there are a few housekeeping things to do with the radio, including setting the preferred channel order, choosing the stick mode and calibrating the controls.

Turn the radio on and wait for the introduction to finish. You may see warnings about the throttle setting or switch positions. Note that the radio doesn't function until the warnings are cleared.

The radio is now ready to set up for first use. Let's take it a step at a time and do just the minimum needed to get started.

Home Screens: There are five home screens that display the information such as control positions, elapsed time, and transmitter voltage. Four of them have the trim positions shown graphically on the bottom and sides, while the fifth displays telemetry data, if available. Use the UP and DOWN parts of the cross-shaped key to change between the various home screens.

Here is one of the most useful home screens. It shows graphically the servo outputs of the radio:



As a first step, we want to get to the Radio Setup and other screens that provide information and enable the adjustment of settings relating to the basic functioning of the transmitter. Press the left side of the cross-shaped navigation button for about half a second. We'll call this LONG LEFT, as opposed to a short press LEFT. You'll soon get used to this very important difference.

You are now in screen 1 of 11, Radio Setup:

Channel Order: Using the DOWN part of the cross (we'll call this the DOWN key from here on) go to near the bottom of the page where you will see Channel Order. RETA, for example, means Rudder, Elevator, Throttle, Aileron. This is the order in which the signals for the four primary channels are sent, via the module, to the receiver, and thence to the servos.

This channel order determines the sequence of controls used throughout the transmitter for setting up and editing all models and the sequence of channels used on your receiver for the connection of your servos. To change it, highlight and use the LEFT and RIGHT keys to select the order you want. For example, modules and receivers using the Spektrum protocol always use the sequence TAER, as their failsafe arrangement requires the use of channel 1 for throttle.

Stick Mode: At the bottom of the Radio Setup screen you will see Mode, meaning the way in which the sticks are set up to control the first four channels. This allows you to set the transmitter programming to match the physical arrangement of its sticks. In many parts of the world, Mode 2 is most popular. This has aileron and elevator (spring-centred) controlled by the right stick while rudder (spring-centred) and throttle (friction) use the left stick. The other popular setup, Mode 1,

has throttle on the right and elevator on the left. Using the on-screen diagram as a guide, select the mode that matches the physical setup of your transmitter (instructions can be found on-line about how to change the physical transmitter mode if necessary).

Make sure none of the stick functions (RUD, ELE, etc.) is highlighted, as that would mean the stick direction is reversed relative to trim direction. Only if you modify the transmitter to use a different type of stick might you want to use this capability.

Note that Channel Order and Stick Mode are two separate and unrelated settings.

Calibration: Short presses of either the LEFT or RIGHT navigation button will take you to page 9/11, where sticks and potentiometers (pots) are calibrated. **Be sure not to skip this vital step**!

Follow the instructions on the screen, beginning by pressing the MENU key. You will be asked to centre the sticks and pots. When that's done you are asked to move each stick to the extreme edges of its total movement. Don't force the sticks, just move them gently to the ends of travel, using normal pressure. When you get back to the start page as shown above you have finished.

Battery Voltage Calibration: *This is important as it makes sure that your alarms are working to the correct voltage.* Press LEFT to get to screen 8/11, where the voltage at the bottom can be adjusted to match the actual measured transmitter battery voltage, ensuring that the value on the home screen is accurate. For very important information about enabling a battery warning and the settings to use for your particular type of battery, please see *9XR: Introduction to the Hardware.*

Other Settings: The other settings in the radio setup screens, such as owner name, backlight settings, etc. are discussed in *9XR Pro: Ersky9x Explained* and can be ignored for now.

Setting up a Model

It's time to move from the Radio Setup side of programming, which applies to all models, to Model Setup, which must be done for each separate model.

Press LONG EXIT to get back to the Home pages.

Model Select

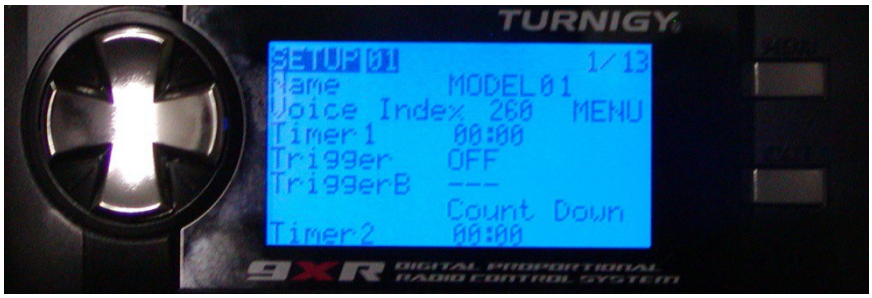
From the Home page, press LONG RIGHT to get to the Model Select page.

(Note that a short right or left press in some home pages will simply change the channels displayed from 1-8 to 9-16 or 17-24. This can be very confusing, so be sure to press firmly for half a second or so.)

You will probably see Model 01 as the only named model (unless you have already been playing with the radio!).

Model Setup

Press SHORT RIGHT and you will be at page 1 of 13, Setup 01. Take a quick look at the whole page but you don't need to change it yet. All of the default settings should work for now. You can come back later and fill in the blanks for Name, Timer and other settings using the details provided in the manual *Ersky9x for the 9XR Pro Explained*. At this point, we just want to get our first model in the air!



Mixer

Make sure the cursor is at the top of the page (press EXIT if it isn't), then press SHORT RIGHT repeatedly until you get to page 5/13, Mixers. As you will learn in detail later, this screen is the key to setting up Ersky9x to assign the available control inputs (stick positions, switch settings, pots, etc.) to the various servos and other types of output.

What you will see is the first four channels assigned to the four stick inputs in the order chosen earlier under Radio Setup (here RETA, but yours might be TAER, AETR, etc.). The 100 means that full movement of the stick will produce 100% movement of the corresponding servo.

This is all you need to fly a simple four channel model. In this case, the Rudder stick controls channel 1, so the rudder servo will be plugged into the first slot on the receiver (even if the slot is labelled differently). Elevator gets channel 2 and Throttle (the speed control or throttle servo) gets channel 3 in this setup. The Aileron stick here controls channel 4, so the aileron servo plugs into slot 4. If you are using a DSM2/DSMX module and receiver (such as the OrangeRX), your order should be Throttle, Aileron, Elevator, Rudder.

Throttle Cut

Using a template.

Even for a simple model, though, we need to be safe. Assuming the model is electric powered, we need a way to prevent the motor starting accidentally, potentially causing damage or injury. We need a throttle lock switch.

This is easy to arrange because Ersky9x provides several templates, one of which will do the job.

Short presses LEFT or RIGHT will take you to page 12/13, the Templates screen. (It's quicker to go left to get there because it's only two key presses, not 12!)

There in Templates 02 and 03 you will see two kinds of throttle cut mix. T-Cut simply enables the THR.CUT switch on the transmitter to disable the throttle stick. Sticky T-Cut goes one step further in safety and requires you to move the throttle stick to Low before the throttle is re-armed.

Let's use Sticky T-Cut. Highlight it by using the UP and DOWN keys, then press LONG MENU. You will feel the transmitter vibrate to signal that a change has been made.

To see what has been done, go back to page 5/13, the Mixer screen. Short press EXIT to take you to the top of page 13 and then short press LEFT a number of times to go to page 5.

You will see that implementing T-Cut has added an extra mix to the throttle channel. The function of this is to replace the throttle stick input with a full low throttle setting when the THR.CUT switch is activated. (If you want to see what's going on, go to the Mixer screen and look at Channel 14. To understand the logic, you'll need to study *Ersky9x Explained*.)

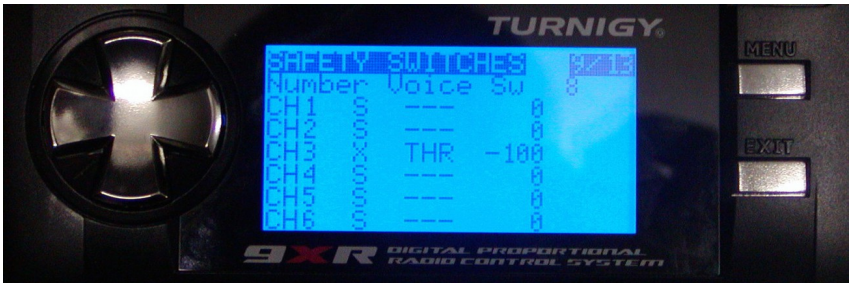
Using a Safety Switch

To get to the Safety Switches page, press LONG RIGHT from the home pages then successive RIGHT presses until you get to page 9/13.

There are now 4 'type' options: S, A, V and X:

S = safety switch A = Audio switch V = Voice switch X = Sticky Safety switch.

To set a sticky safety switch on the throttle channel, just select type as X, set the switch as THR and the value as -100% (i.e., full low throttle).



In this case Channel 3 (i.e., the third servo socket on the Rx) is the throttle channel. When the THR switch is positive then the sticky throttle cut is active.

To see how 'sticky' throttle cut works, long press EXIT to get back to the home screens. Press UP or DOWN to find the home screen which shows graphically the travel of each servo. Operate the sticks to verify which stick makes which servo output move. Move the Throttle stick to a middle or high position and watch what happens when you flick the THR.CUT switch upward. The throttle goes to low and is unaffected by further stick movements. With the stick at part throttle, flip the THR.CUT switch down. If you chose Sticky T-Cut, the throttle stick still does not work. Move the throttle stick down to low throttle and then move it back up and the throttle stick now works as it should. Thus you have a safety switch for the throttle which ensures that you cannot operate the throttle until the throttle stick has returned to zero throttle.

Binding

You are now ready to bind your receiver to the transmitter according to the instructions of the manufacturer of the module and receiver. Binding is the process of having the receiver memorize the unique ID number of the module so it will respond only to your transmitter and not to any others that might be turned on.

For DSM2/DSMX protocol receivers, binding also sets failsafe, so be sure your throttle is low when you do it. Other radios set failsafe differently. Please read the instructions!

Checking Operation

After binding, turn the transmitter and receiver off and back on. Note that except when binding, the transmitter should be turned ON first and OFF last. Check that all the controls move in the correct directions.

In particular, for an electric model, check (very carefully, preferably with the propeller removed!) that the electronic speed controller (ESC) arms itself and then operates correctly. If not you may have to reverse the throttle channel. Note that failure of the motor to start or respond correctly to the throttle stick is nearly always a matter of ESC calibration, rather than radio settings. Read the ESC manufacturer's instructions carefully before plugging in or turning on!

If you need to change the direction of a channel, go to screen 6/13, Limits. Move DOWN to the channel involved and RIGHT to the last column. To reverse the channel, press MENU once to change '---' to 'INV' for Invert. If you need to change other channels, you move UP or DOWN. When done, press SHORT EXIT.

Note: You can also reverse a channel by changing ‘100’ to ‘-100’ in the Mixer screen.

With the controls going the correct way, check that you have sufficient control movement and not too much. Adjust the mechanical linkage, i.e., the servo arm length and the control horn length, to give the correct movement. Later, we’ll see how to use the features of the radio to adjust control throws and response, but for now you should have a setup that works like a simple, non-programmable transmitter. Power up and go flying!

Basic Improvements to the Model Programming

Now you have been out in the field and used your new radio, it’s time to refine the settings and make flying a little easier, using the capabilities of transmitter programming. You probably want some exponential for ailerons and elevator, as well as dual rates. Perhaps the throttle response is not ideal. So let’s look at making your model behave better using craft, cunning and Ersky9x to its full capability.

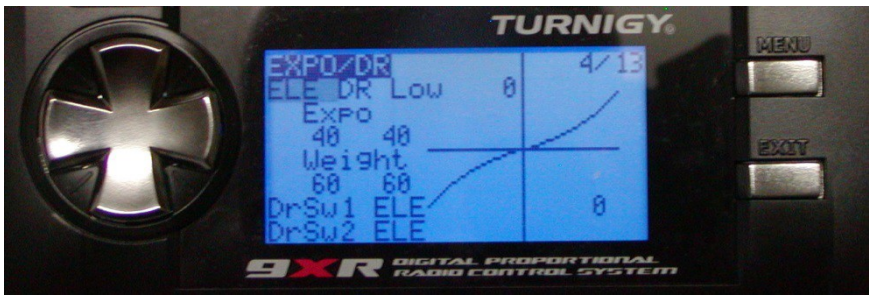
Expo and Dual Rates (D/R)

Expo, or to use the full name, exponential travel, reduces the control surface sensitivity around neutral for softer response while retaining the same volume of travel overall, i.e., the control rate is lower for small movements but higher for large amounts of stick travel. Depending on the geometry of your servo arms, the linkage and the position of the horns on the control surface, as well as the characteristics of the model, you will need different expo ratios to achieve the most comfortable feel on different models. Note that Ersky9x uses positive numbers to describe regular expo; some systems such as Futaba call the same thing negative expo (yes, it’s confusing!).

Dual (or triple) rates do what the name implies – give you a choice of overall response rate. So a model might have low rate set up for takeoff, easy going cruising around, and landing, with high rate for more extreme maneuvers. Rates for the three main controls can be set up so that all are controlled by a single switch or each can be switched separately. Often, different expo settings are associated with each rate and control.

Look at the graph in the example below. It is flatter in the middle than at the ends. This means that the elevator moves less for stick movements near the centre than it does at the ends.

In Ersky9x, page 4/13 is dedicated to Expo/DR as shown below. Move the cursor to the first line, where you can change which control stick is to be adjusted. Suppose we want to adjust elevator, so press RIGHT to move to ELE. The rate will be shown as Hi until you set a switch to control it.



Start by adjusting High rate. Press DOWN to highlight the Expo values and use the LEFT and RIGHT keys to set a fairly conservative expo value such as 25%. Then move DOWN to Weight, which should already be set at 100%. Adjusting this is one way to fine tune the travel (the other way is to use the Limits page 6/13).

Turn on your model. You should already have set it mechanically to give plenty of control, but here you can dial down the response. Adjust the weight value until you are happy that the high rate travel is suitable. Let's suppose you choose 90%.

Now move down to highlight the DrSw1 value. You can choose any physical switch here by using the LEFT/RIGHT keys. Note that moving to the right of "---" gives you the normal switch setup, represented by, say, ELE, while moving to the left of "---" gives the logical opposite, represented by !ELE (read as "not ELE"). Here we chose plain ELE for both switch settings, both DrSw1 and DrSw2.

You can also choose a switch by simply using it. Move it to the required position and it will show on the screen in that position.

Now flip the switch and note that the rate shifts between Hi and Low.

You already have Hi rate set to 30% expo and 90% weight. Flip the switch to Low and set, say 40% expo and 60% weight (as shown above). This will give smoother control with the ELE.D/R switch in the down position.

Set up the rudder and aileron in a similar way, using what you think to be reasonable values. You can control all of them with the ELE switch, or use a separate switch for each.

Now you are ready to fly with expo and dual rates available. Try out the settings in the air. Adjust until you feel comfortable with the response. One guideline is that for mild control in low rate the model should take a couple of seconds for one complete roll, while full up elevator should give a large loop. Make sure you have enough elevator travel on low rate to flare for landing at slow speed.

If the model is twitchy, you can increase the expo value for softer control around neutral. Be careful if using expo above about 40%, as it can result in unexpectedly large movements at the ends.

Mixes

We've seen that even the most basic model programming is built around mixes that define the way in which each of the primary controls links the movement of a stick to the response of a servo. Now it's time to think about other kinds of mix that bring together two controls.

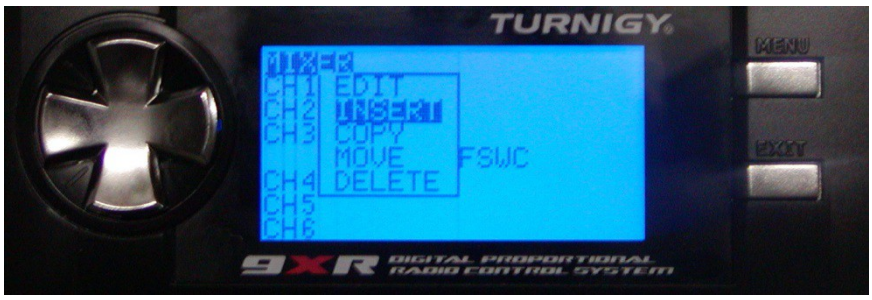
For example, some models fly much better with a little rudder in the same direction as aileron. This usually applies to relatively long wingspan models, such as gliders or the Piper Cub. The rudder action counteracts skidding produced by the differential drag of up and down aileron. When we move the aileron stick to bank, we might want the radio to add a little rudder into the turn.

Another example. With some models like the Spacewalker, knife-edge flight is a lot easier if applying rudder to keep the nose up is accompanied by a little aileron. This can prevent the model from trying to roll out of the knife-edge position. The correct rudder-to-aileron mix can help you a lot as a pilot.

In these examples you have a primary control which brings about the desired movement and a secondary control that improves the response to the first one. In the case of the Piper Cub, the primary control is aileron and the secondary one is rudder – you need a lot of aileron and a bit of rudder to make a coordinated turn. The rudder alone responds when its own stick is moved, but it also moves in unison with aileron when that stick is moved.

In the MIXER screen (page 5/13) you see a summary of the mixes for each output channel. The list down the left shows the numbers of the channels into which you plug the servo leads.

Let's enter an aileron-to-rudder to mix for our Piper Cub. Move the cursor down to highlight RUD. Press Menu. A pop-up screen appears:



Select INSERT and press MENU. This adds an extra line for the Rudder servo channel that allows it to be controlled by the Aileron stick.

When we move the aileron stick we want the rudder to move in the same direction, but only by a small amount, say 20%. Here's the screen that shows the extra mix that is added to the Rudder servo channel:

And here's how the mixer screen looks when we have inserted those values into the Edit screen:

The rudder servo now has 20% movement when the aileron moves 100%. In a turn when you move the aileron stick to bank the aircraft the rudder will move to give a better coordinated turn without the pilot having to move the rudder at all. But when steering on the ground, for example, you still have 100% control of the rudder by using the rudder stick. The plus sign means the two inputs to the rudder channel are added together.

Of course there are many other useful mixes. You can add a little elevator (up or down) to compensate for the pitch change when you operate flaps. On a glider, you can have the flaps move with the ailerons to enhance roll control in normal flight, and then have them perform an entirely different role with both ailerons up and both flaps down for “crow” braking. And you can have the radio slowly move the elevator down a small amount to prevent looping as your electric glider accelerates during a climb, with the elevator returning to glide setting when the motor is shut down.

The mixing possibilities are endless with the powerful programming of the 9XR Pro. But you don’t have to learn all this all at once. So enjoy flying your simpler models while you plan to get the most out of your transmitter.

General Advice for Model Setup

Before we leave the subject of mixing for now, here is some advice based on experience. Before long you are going to have lots of models with different functions controlled by various generically identified sticks, switches and pots. You will inevitably lose track if you don’t take steps to organize and record your programming. It’s particularly bad if this happens in flight! So….

1. Standardize your channel order. Whether you adopt a widely used sequence like TAER (Spektrum) or AETR (Futaba) or have your own preferred order, choose one, select it in Radio Setup and stick to it.

2. As far as possible use the same switch for the same function for all your models. For example, always use the same switch for throttle cut (it doesn’t have to be the switch labeled THR.CUT). Likewise, standardize your Dual Rate switch setup on all your models, except where there is a specific reason not to. Glider setups are often very different from those of other models, but at least standardize your gliders. And keep a notebook to refer to when you forget.

3. The Mixer page (page 5/13) is the key to well organized control in Ersky9x. Use weights of 100 for all primary controls and adjust your mechanical linkages to allow long servo arm travels. This produces the best centering accuracy and provides small steps of fine adjustment for trimming and for sub – mixes. For example, if you need just 3% aileron mixed with rudder for knife edge flight, 3% of full servo travel will be much more accurate and repeatable than 3% of say 40% servo travel. Likewise, any slack in the linkages will have less effect when the servo arm moves full travel.

4. Set the mix which demands the most servo travel first. For example the CROW function on gliders, where the ailerons travel up and the flaps travel down, requires full servo arm travel. For a 3D model, set up the 3D aerobatic mode first and then set the lower rates later. For a hotliner glider or as pylon racer set the large travels needed for slow speed landing first and then the smaller travels for racing mode later.

Matching 9XR Pro Throw to Other Radio Systems

It's important to note that 100% on Ersky9x firmware corresponds to 125% on traditional transmitters. Conversely, 100% on a Spektrum or Futaba transmitter is equivalent to 80% on the 9XR Pro. This matters if you are trying to match an existing setup designed for a traditional radio.

Limiting throw is really critical when it comes to programming ultra-micro models, such as the BNF models from Blade, E-Flite and ParkZone. These use linear servos that will be physically damaged if driven too far. That's why their instructions warn strongly against using settings of more than 100% for a standard radio. For the 9XR Pro, this means throw MUST NOT exceed 80% for channels 1 through 6.

There are two ways achieve this. One is to use 80% weights instead of the usual 100% in the Mixer page. A better way is to leave weights at 100% but go to the Limits page and change limits from 100 to 80 for channels 1 through 6.

Rotary Wing Models

Up to now, we've been talking about setting up the transmitter for fixed wing models. Of course, it works equally well for helicopters and multi rotor models, but it does require some adjustment in thinking if you are coming from experience with a more traditional transmitter.

The first thing to recognize is that all programming requires that you understand exactly what needs to be done, and this is especially so for rotary wing models. It's doubly true for the ersky9x used in the 9XR Pro, as the very power and flexibility of the firmware requires that you tell it exactly what you need it to do. So you have to understand both your transmitter and the requirements of your model. We can't explain in these few pages how to set up a flybar helicopter or how to program the controller in a quad or flybarless heli. Fortunately there's lots of good information out there in the specialized forums and in the form of video tutorials.

For the traditional flybar helicopter using CCPM (Cyclic Collective Pitch Mixing), Ersky9x devotes a page to setup. This page provides for different swash designs (90, 120 and 140 degrees). The inputs to CCPM are aileron, elevator and throttle/pitch from the sticks, while the outputs of the mixing are sent to the three swash servos, where they move the swash plate in such a way as to produce cyclical (aileron and elevator action) and collective (pitch control) movements. Details of CCPM setup are available in the forums.

For flybarless helis and multirotor models, the mixing is done by the control panel, and the basic control setup is generally very simple. The complexities come in providing the signals required to change the various modes of the control unit; this may require programming multiple switches to work together. This varies from one controller to another and is beyond the scope of this simple guide. Just keep in mind that ersky9x can do just about anything you ask it, but you have to figure out the question!

Other Possibilities with the 9XR

The manual *Ersky9x Explained* is a great help in finding your way around the screens and getting full use of your new radio.

When you operate a switch or turn a potentiometer you can have beeps or voice announcements to confirm what action you have just taken. You can have voice announcements of alarms and a

timer count down or count up, your model name can be announced at start up. See *Using Voice with Ersky9x* for details.

Compatible telemetry is available for the FrSky system and will soon be for DSM-type systems. You will need to use a transmitter module and receiver with telemetry capabilities, along with suitable sensors. The most useful parameters include signal strength received by the model (RSSI), battery voltage, fuel level, and (for gliders) variometer data. Data is delivered via voice or warning sounds, as looking at the screen while flying is not recommended!

A special cable or hardware modification is generally needed for telemetry. The required enhancements are beyond the scope of this manual and require some technical skill. For detailed information about FrSky telemetry, see:

http://www.eflightwiki.com/eflightwiki/index.php?title=FrSky_Telemetry

Further Information

For additional information to help you understand and make best use of your Turnigy 9XR Pro, see the other manuals in this series and/or go to one of the forums dedicated to this transmitter and the open source firmware it uses.

9XR Pro Manuals

The following manuals are designed to help you get the most out of your Turnigy 9XR Pro. They are available at: http://openrcforums.com/forum/viewforum.php?f=7

1. 9XR Pro: Introduction to the Hardware
2. 9XR Pro: First Steps with Ersky9x
3. 9XR Pro: Ersky9x Explained
4. 9XR Pro: Communicating with a Computer
5. 9XR Pro: Using Voice with Ersky9x
6. 9XR Pro: Using the Eepskye Program
7. 9XR Pro: Glossary of Terms

Internet Forums

Help is always just a few clicks away on the internet forums where experienced Ersky9x users volunteer their knowledge and experience. Many of these people have been developing the firmware for years without remuneration; all they ask is donations to fund further development.

Open RC Forums: http://openrcforums.com/forum/index.php

Ersky9x index page: http://openrcforums.com/forum/

9XR index page: http://openrcforums.com/forum/viewforum.php?f=70