DragonLink Advanced Transmitter

A quick introduction

- to a new a world of possibilities

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Chapter 1

Disclaimer and notes for early release

This documentation was written for the first beta-testers and is not intended to be used as a complete documentation. However, it should give a quick overview.

Currently, with beta release v. 2.3, the following limitations should be noticed:

- **Logging to µSD-card:** The file-system for logging to µSD-card, is still in the works. Currently, SD-logging is not enabled.

- **V2 RF protocol:** The implementation of the old V2 RF-protocol is currently not working, due to major rework and optimization of the firmware and RF handling, to focus on the potential of DragonLink Advanced. The V2 protocol is expected to be supported fairly soon, but only with support for Micro-receivers. The old V2 receivers might be supported at a later state, but is still uncertain.

- **Output power:**
  
The output power have been calibrated based on data from a few devices. Actual deviation from device to device is yet to be determined.

- **Spectrum output** The spectrum output haven’t been enabled yet.
Chapter 2

Introduction

The DragonLink Advanced transmitter, is a huge advance in technology. Offering even better RF-performance, better connectivity, logging compatibility and much better flexibility, the DragonLink Advanced transmitter is a great upgrade.

- Ultra long range RC link, utilizing reliable FHSS technology
- Support for bi-directional communication
- High outputer power, fully configurable, with up to 1 W output
- USB connection for easy configuration
- SD card for logging
- Bluetooth for interfacing with mobile and tablets
- Extra knob and switches, to add extra channels
- Dual PPM inputs, fully configurable
- Buzzer and bright LED’s
- 25 % more efficient RF protocol compared to our V2 system, resulting in 25 % faster update, with no downside

The general specifications can be seen in table 2.1.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-17 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>+30 dBm, 1 W</td>
</tr>
<tr>
<td>Interface</td>
<td>USB, bluetooth, µ-SD, PPM &amp; expansion port</td>
</tr>
<tr>
<td>Max current at 12 V (bi-dir)</td>
<td>320 mA</td>
</tr>
<tr>
<td>Max current at 12 V (one-way)</td>
<td>480 mA</td>
</tr>
</tbody>
</table>

Table 2.1: Quick summary of receiver specifications
Chapter 3

The hardware

3.1 Powering the transmitter

The DragonLink Advanced TX must be powered using "Input 1". The pins can be seen in figure 3.1, with PPM, input voltage and ground respectively. In table 3.1 the input and respective pin-function can be seen.

The transmitter is designed to operate from 6 to 17 volt, allowing the use of 2S - 4S lipo.
At 5.5 volt the output power will start to decrease slightly and around 4.5 volt the transmitter will shut down, allowing good safety margin, even with a discharged 2S lipo battery.

![Figure 3.1: DragonLink Advanced TX inputs](image)

<table>
<thead>
<tr>
<th>Pin 1</th>
<th>Pin 2</th>
<th>Pin 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input 1</td>
<td>PPM 1</td>
<td>Input voltage</td>
</tr>
<tr>
<td>Input 2</td>
<td>PPM 2</td>
<td>Voltage out, from input 1</td>
</tr>
</tbody>
</table>

Table 3.1: DragonLink Advanced TX connections
3.2 DragonLink Advanced TX compatibility

The new Advanced TX will be fully compatible with the new series of receivers, consisting of the MicroRx, CopterRx and Advanced 12-channel receiver. All receivers will offer bi-directional capabilities, but only the 12-channel Advanced receiver, will have full bi-directional range. All receivers will have equal RC-range.

Support for the old 12-channel V2 receivers is not planned at this moment.

Figure 3.2: DragonLink MicroRx

Figure 3.3: DragonLink CopterRx

Figure 3.4: DragonLink Advanced 12-channel receiver
3.3 Menu selection

For easy handling and configuration in the field, a simple menu can be entered upon power-up. The menu and functionality as equal to the V2 TX with NextGen firmware.

The menu is entered, by holding the ”Menu” button while powering the transmitter. The transmitter will respond with a ”beep”, indicating menu selection one. Keep holding the menu-button, until the menu you wish to select is indicated. The menu is indicated by a LED-color on LED B as well.

1. **Range test**
   This mode is used for range-test. The RF-power will be heavily attenuated, making it possible to make a quick range-test on the ground.
   Press the menu-button again to exit this mode.

2. **Bind**
   This mode is used to bind a receiver. This is necessary if you get a new receiver or change RF settings in the GUI.

3. **Servo test**
   The transmitter will sweep all channels, from end-point to end-point.
   Press the menu-button again to exit this mode.

4. **Change ID**
   The transmitter ID will change and the transmitter will automatic restart. All receivers must be rebound after changing ID.

3.4 Setting failsafe

If the link is broken between the transmitter and receiver, the receiver will enter failsafe. The failsafe-mode can be set on the on the receiver, but the default setting, is to use a user-configured position.

The failsafe position can be set anytime, by simply pressing the Menu button for 1-2 seconds. This will result in a ”beep” and a blue indication on LED A.
Chapter 4

PC software

4.1 Installing the driver

On the DragonLink Advanced TX, a normal USB Micro B connector can be found. The connector is the same, that’s used on most mobile-phones and a lot of other USB devices. On figure 3.1 the USB connection can be seen.

The USB port will supply enough power to allow configuration and normal operation, but the LED’s, buzzer and power-stage of the RF-circuit will NOT be powered. With only USB-power supplying the transmitter, range will be extremely limited. USB powering the transmitter is only intended to be used for easy configuration and tests, without the need of an external power-source.

The driver used for the Advanced TX, is the same as the MicroRx, CopterRx and 12-channel Advanced RX. First time the device is connected, windows will search for drivers, but not be able to find a matching driver. In windows, right click on my computer, select properties, and go to Device manager.

In picture 4.1 a DragonLink MicroRx can be seen in the device manager, with no driver installed. Right click on the device, select ”update driver software”. Select ”browse my computer for driver software” and select the driver folder included in the DragonLink download for the Advanced TX or any of the receivers, that will have the same driver included.

When installing the driver, windows will show a warning, indicating that the driver is not signed. Select ”install this driver software anyway”, as shown in figure 4.2. If the not signed driver is giving problems, we have an alternative signed driver that can be used.

The driver should now be successfully installed, and you should get the message as shown in picture 4.3
4.1. INSTALLING THE DRIVER

CHAPTER 4. PC SOFTWARE

Figure 4.1: DragonLink MicroRx in device manager without driver installed

Figure 4.2: Windows message about driver not being signed

Figure 4.3: Driver successfully installed
4.2 Using the GUI

The Advanced TX supports a great amount of flexibility, compared to its predecessor. Most people don’t have to touch any settings for normal use, but the flexibility allows better customization for individual needs.

The beta-release of the configuration user interface, can be seen in figure ??.

Starting with the RF settings, seen in the box to the right, a number of settings can be chosen. Below, each setting is described in short.

- **RF protocol**
  The RF protocol selection, is used to set the overall RF handling. The current options, are V2 (disabled atm) and DragonLink Advanced protocol. The V2 protocol is only available for backwards-compatibility. Only the band selection have effect on the V2 protocol. The remaining settings, can only be used with the Advanced protocol. The Advanced protocol have superior update-rate, slightly better immunity and much better flexibility than V2 and should be used when possible.

- **Use bi-dir**
  The bi-directional support on DragonLink Advanced, can be enabled and disabled depending on needs. Enabling the bi-directional communication, allows the receiver to send back information like supply voltage, GPS-information etc. Enabling bi-directional communication will slightly lower the update-rate of the RC-signal.

- **RF band**
  The ”normal” RF band, is the best choice for most people. It effectively avoids harmonics getting near the video-channels and uses a fairly wide hopping-bandwidth. The ”wideband” selection uses a larger bandwidth for the hopping. This can result in problems with noise on specifically 1280 MHz video, but can be an advantage, if depending on the noisefloor and active users.

- **Trans. channels**
  The number of transmitted channels, describes how much data that’s transmitted in each data-package. The less channels transmitted, the faster update-rate. Without bi-dir enabled and with default settings, 12 channels transmitted gives an update-rate close to 50 Hz. Going from 12 channels to 8 channels transmitted, will give approximately 20 % increase in update-rate. Going from 12 channels to 4 channels, yields approximately 40 % increase in update-rate. For 95 % of the users this wont make a difference, but if bi-dir is enabled and you are doing acrobatic, this might be of interest. Note that this setting wont affect the servo update rate.

- **Uplink baud**
  Setting not enabled yet!
  The uplink baudrate sets the speed of data-transfer of the signal going from the RC-transmitter to the plane. The faster the baudrate, the faster update-rate, but worse sensitivity. 9600 baud is normally the best tradeoff, that will fit all pilots. However, we like to give you the choice. If you are flying 3D or racing with a 250-size quad, you might prefer a crazy update-rate and don’t care about the 40 kilometer possible range?

- **Downlink baud**
  Setting not enabled yet!
4.3 Updating firmware

Firmware update is performed by using the separate program called DragonLink_Firmware_Updater_v1_2_beta.exe. Connect the transmitter via USB and launch the program (the order doesn’t matter). The beta version of the update utility can be seen in figure 4.5.

When the utility have re-booted the transmitter, LED A will be constant blue and LED B will flash red and blue. Press ”select firmware” and find the latest firmware-file. For convenience, the file-extension of the firmware-files are called .V3Tx.

With a firmware-file selected, press upload and wait for the firmware to be transferred and unpacked.

It’s strongly recommended not to interrupt the firmware-update. If the update is interrupted or fails, it’s important to re-do the firmware update. In rare cases an interrupted firmware update can result in a bricked transmitter. See next section for emergency firmware update.
Figure 4.5: GUI for firmware update

Figure 4.6: Successfull firmware update
4.4 Emergency firmware update

If the transmitter can’t enter firmware-update mode for any reason, there’s a backup solution. It should never be needed, but "just in case". To force the transmitter into bootloader mode and accept new firmware, set the switches in max position (3) and turn the knob all the way clockwise. Make sure no external power-source supplies the transmitter and insert the USB-cable while holding the button. The transmitter should now be in bootloader mode, accepting new firmware.
Chapter 5

Features

5.1 Remote spectrum analyzer

With bi-directional enabled, a feature for remote spectrum scans is available. With everything mounted in the plane (or any other platform), it’s often a challenge to connect the USB-cable and keep the plane away from any noisy sources. With the remote spectrum analyzer, no cables are needed, simply connect the Advanced TX, go to "spectrum analyzer" and press "start remote analyzer". The plot will update live as usually and everything is done while maintaining a valid RC-link.

![Figure 5.1: Remote spectrum analyzer](image-url)
5.2 Remote receiver config

To make things easier, the basic configuration settings for the receiver, can be configured wireless. When a link between TX and RX is established (and the Advanced TX connected to the PC using the USB cable), the tab "MicroRx config" can be used. This makes it possible to configure the receiver, without trying to connect a USB-cable to the receiver - that always tends to be placed very well in the airframe, completely impossible to access.

Figure 5.2: Remote receiver config
5.3 Bluetooth

The bluetooth is currently used with Mavlink protocol, to track the position of the plane. If bi-dir is enabled and a GPS connected to the receiver, the bluetooth module will transmit the GPS-coordinates using the Mavlink protocol, making it possible to track the position of the airframe with droid planner, mission planner or any Mavlink client.

The radio-modem will later selectable to be used with either the cabled connector or bluetooth.

The bluetooth code for pairing is: 0000
5.4 Radio modem

The radio modem functionality, is intended to eliminate the need for extra hardware, while giving a very reliable data-stream. The radio modem is currently limited to 200 bytes/second down and 100 bytes/second up.

To use the DragonLink system as a radio modem, the receiver must be setup, to accept transmit and receive data on a pin. See figure 5.3, for configuration in GUI.

![MicroRx outputs](image)

Figure 5.3: Radio modem - select serial in/out

The baudrate for the input/output serial data stream, must be configured. See figure 5.4.

![Radio modem - set baudrate on RX](image)

Figure 5.4: Radio modem - set baudrate on RX

On the TX, the baudrate must be set in the same manor, as shown for the receiver. The baudrates on the transmitter and receiver doesn’t necessarily have to match, but usually the same baudrate will be used. With current firmware (v. 2.3) using high baudrates, will result in lost characters.

On picture 5.5

![Radio modem - pins used on transmitter](image)

Figure 5.5: Radio modem - pins used on transmitter
5.5 Voltage sensor

On the receiver, a voltage sensor can be connected, to monitor battery supply. The voltage information is sent back with the telemetry link. This allows the TX to warn in case of low battery-voltage.

To enable the voltage sensor, select "voltage sensor" for pin 6, as seen in figure 5.6.

![Figure 5.6: Voltage sensor input select](image)

To enable low voltage alarm, use the TX configuration utility to enable "Low flight voltage" alarm under "Alarms and sounds" and set the warning threshold under "Remote config". Please see figure 5.7.

![Figure 5.7: Configuration low voltage warning on airframe](image)
5.6 Alarms and sounds

![Configuration for alarms and sounds](image)

Figure 5.8: Configuration for alarms and sounds
Chapter 6

Misc

6.1 SD logging

6.2 Error codes

At start-up, the transmitter will run a series of self-tests, to ensure that everything is working as expected. While the errors should never show up under normal use, they are implemented to ensure reliability and give a warning in case of any detected problems.

The buzzer will continue to buzz a number of times, equal to the error code. After h buzzes, there will be a short break and it will continue to buzz the error code again.

1. Not used, to avoid confusion.

2. Problem validating saved settings. Default settings loaded and saved. Power-cycle the receiver and bind again. Settings from GUI will also be reset. This is normal to see after a firmware update.

3. Problem initialising memory for data logger

4. Problem with the RF hardware

5. Overvoltage detected (feature not enabled yet)