Tutorial AR Drone Miru Mod on Windows 7 with DX6i, Part 4 DRAFT 1.8
UFO Doctor, Aug. 11th, 2011

Introduction:

Three tutorials have been published up to now:

Tutorial Miru Part 1_V8: Miru Mod, Material, Cable Connections and Test-Setup
http://ufo-doctor.ch/descriptions/Parrot%20Infos/Tutorial%20Miru%20Part%201_V8.pdf

Tutorial Miru Part 2_V4: Installation of the Miru mod in drone and first flight
http://ufo-doctor.ch/descriptions/Parrot%20Infos/Tutorial%20Miru%20Part%202_V4.pdf

Tutorial Miru Part 3_V4: Selectable configurations and clamp for iPhone on TX
http://ufo-doctor.ch/descriptions/Parrot%20Infos/Tutorial%20Miru%20Part%203_V4.pdf

And here the new stuff: (A long discussion with Miru!)

Tutorial Miru Part 4_V8: Visible Low Battery Alert and Emergency Landing

14. Characteristics of the Battery Level Indicator, displayed on iPhone

14.1. Test Setup

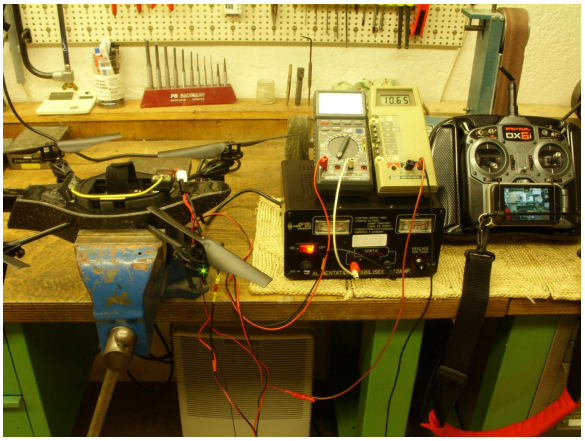


Fig. 23. Test Miru Mod 007
on Test Bench.

The drone is fixed in a strong clamp; the power supply is a modified 15V/10A device.

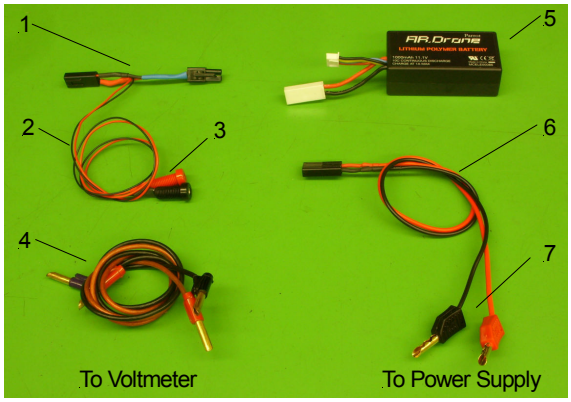


Fig. 24. Test cables
1: Tamiya bridge with thin cable (2) and **female** contacts (3).
WARNINGS do not use **male** contacts! (If the bridge is connected to Lipo, open male contacts may get short-circuited!)

4. Cable to voltmeter
5. Lipo Battery
6. Thick and short cable with male contacts (7) to power supply

14.2. iPhone Battery Capacity Reading versus actual Lipo Battery Voltage:

General settings:
- Miru Mod 007
- Configuration 1
- Voltage measured directly at the drone supply terminal
- iPhone 4, FreeFlight 1.8 (for Battery Level monitoring)

Info given by iPhone display:
%Bat : Battery capacity value
A : Battery Low Alert
E : Battery Low Emergency

Test 1: Drone not started, current 0.27A

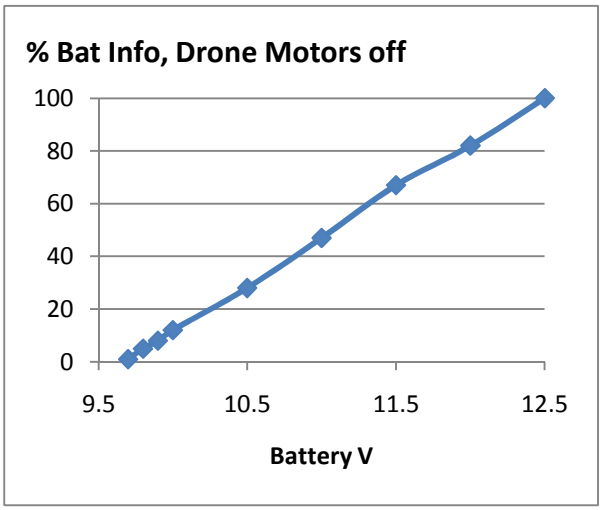
Result 1

Uin(V)	%Bat	Info
12.5	100	
12.0	82	
11.5	67	
11.0	47	
10.5	28	
10.0	12	
9.9	8	A
9.8	5	A
9.7	1	E

Result 2

Uin(V)	%Bat	Info
12.5	100	
12.0	83	
11.5	66	
11.0	48	
10.5	28	
10.0	12	
9.9	8	A
9.8	3	A
9.7	1	E

Comment: Reset is possible if voltage is recovered



Test 2 : Drone started, current 4.7A

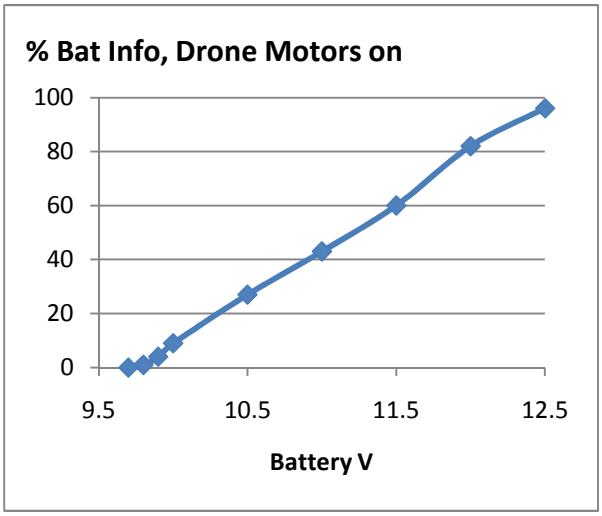
Result 3

Uin(V)	%Bat	Info
12.5	96	
12.0	82	
11.5	60	
11.0	43	
10.5	27	
10.0	9	A
9.9	4	A
9.8	1	E
9.7	0	E

Result 4

Uin(V)	%Bat	Info
12.5	97	
12.0	82	
11.5	60	
11.0	45	
10.5	24	
10.0	8	A
9.9	4	A
9.8	1	E
9.7	0	E

Comment: Reset not possible, change battery



Tab. 2. Experimental results

Conclusion: A threshold of about 15% battery capacity should activate an alert: “Visible Low Battery Alert (VLBA)”

Miru Mod 008 provides this VLBA by an aggressive 5Hz blinking of the motor LED’s!

15. Installation of the Miru Mod 008 on your drone

(Please consult the Miru Mod Tutorials Part 1, 2, and 3 for a full understanding!)

15.1. Programming the Ardunio Pro Mini for DX6i (and for DX7i)

- Disconnect the Ardunio cable from drone
- Connect the Ardunio by FTDI (both prints with IC's upwards!) with your PC
- Start the program Ardunio IDE
- Select the right Com Port by checking Control Panel, Device Manager, here COM8
- Select the board "Ardunio Ardunio Pro or Pro Mini (5V,16MHz) w/ATmega 328"
- Select Sketch, add file, open file "rx2atp.c" (Miru Mod 008!)
- **For DX6i only**: change the lines: #define S_LAND and #define S_FMOD as shown
- Check the last line: #define THR_VLBA, default **15**, you may enter a value 1 to 95
  (This is the threshold %-value of your "Visible Low Battery Alert")

```
#define S_LAND  S_GEAR
#define S_FMOD  S_AUX1

/* transmitter mode, channel assignments of the sticks
 * T_MODE 1 -> left: V-ELEV H-RUDD right: V-THRO H-AILE
 * T_MODE 4 -> left: V-THRO H-AILE right: V-ELEV H-RUDD
 * T_MODE 2 -> left: V-THRO H-RUDD right: V-ELEV H-AILE, US common mode
 * T_MODE 3 -> left: V-ELEV H-AILE right: V-THRO H-RUDD, US reversed */
#define T_MODE  2

/* drone configuration choices
 * outdoor:   TRUE or FALSE
 * no_shell:  TRUE or FALSE
 * max_euler: 0 ... 0.52 max pitch/roll angle [rad]
 * max_vz:    200 ... 2000 max climb speed [mm/s]
 * max_yaw    0.7 ... 6.11 max yaw speed [rad/s]
 * max_alt:   500 ... 5000 altitude limit [mm], 10000 is OFF
 *          outdoor,no_shell,max_euler,max_vz,max_yaw,max_alt */
const char cfg1[] PROGMEM = "TRUE,TRUE,0.35,1500,3.5,10000";    /* default */
const char cfg2[] PROGMEM = "TRUE,TRUE,0.52,2000,6.1,10000";    /* max */
const char cfg3[] PROGMEM = "FALSE,FALSE,0.21,700,1.75,2000";
const char cfg4[] PROGMEM = "FALSE,FALSE,0.10,700,1.50,2000";

/* Visible Low Battery Alert
 * the companion program on the drone can watch the battery percentage, if it
 * goes below THR_VLBA the drone's LEDs flash in RED, set to 0 to turn it off */
#define THR_VLBA        15
```

Fig. 25. Program "rx2atp.c" (Miru Mod 008) with changes for DX6i

- Upload the program and check if you get the message "Done uploading"
- Stop the program Ardunio IDE by closing the COM8 port.

16. Test Miru Mod 008 on test bench and outdoors

16.1. Test Miru Mod 008 without iPhone

In short, the Miru Mod 008 works fine, if you do not use an iPhone in parallel.

Below a battery level of 15 % you will see the drone motor LED's blinking at the aggressive 5Hz frequency. This is the "Visible Low Battery Alert", VLBA

You should land your drone at a good place within the next 30 seconds.
If you ignore this VLBA, the drone will execute the EMERGENCY LAND if the battery capacity reaches 0%. This is a soft landing, and the motors will turn off.

A new start with a fresh battery is ok. Select "LAND" and start the uploading process.

16.2. Test Miru Mod 008 with iPhone

Parallel operation of the iPhone for video and battery monitoring may show some problems, especially at the second start. The problems could be:
- Miru Mod upload process cannot be finished, thus no start possible
- Video/Battery info connection to your iDevice is not possible

Please follow the instructions below:

1. Set the stick mode to "LAND"
2. iPhone: switch off the Wi-Fi connection
3. Switch on the transmitter, after 2-10 sec:
4. Connect the battery to the drone
5. Observe the uploading (40 sec); the Arduino Led will flash at 12.5 Hz at the end.
6. Check if the flat trim is operating
7. iPhone: switch on the Wi-Fi connection, make connection to the drone, and select the app FreeFlight or Flight Record. Video ok? Battery level 100%?
8. Below a battery level of 15 % you will see the drone motor LED's blinking at the aggressive 5Hz frequency. This is the "Visible Low Battery Alert", VLBA
9. You should land your drone at a good place within the next 30 seconds.
   If you ignore this VLBA, the drone will execute the EMERGENCY LAND if the battery capacity reaches 0%. This is a soft landing, and the motors will turn off.

For a **second** start, go back to point 1!

You should at least switch off the FlightRecord/FreeFlight app on your iPhone!

Hint to Point 7: It could be that you have to wait 3 seconds to see the video connection to your drone properly.

Flight durations: With an original Parrot Lipo, used about 20 times: 8 to 9 minutes, depending on throttle settings.

Good luck
Kind regards
UFO Doctor