ZIR target recognition and destruction system

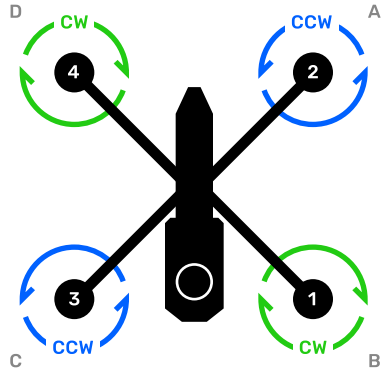
Instructions for the copter manufacturer

The procedure for preparing the copter for installation of the ZIR system and its preliminary setup.

1. Before installing the **ArduCopter** firmware, you need to configure the **ESC controller**. To do this, use the esc-configurator to install the **BlueJay 0.21.0** firmware and set the motor rotation directions as indicated in scheme 1.

   https://esc-configurator.com

SCHEME 1



QUAD X (BETAFLIGHT)

2. Load the **ArduCopter** firmware onto the flight controller.

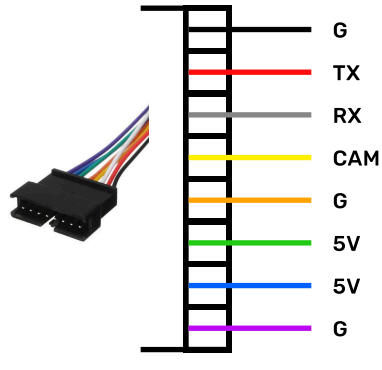
3. In case of absence of the standard barometer, it is necessary to add an external one, such as **BMP280**, or better;

   Install a magnetometer such as **QMC5883L**, or better;

   Solder the **JST SM 2.54 8 Pin Plug Male** connector to the flight controller, as shown in scheme 2.

   https://sharvielectronics.com/product/22-awg-jst-sm-8-pin-plug-male-and-female-connector-with-300-mm-wire/

SCHEME 2



4. Start the **AutoTune** procedure for automatic PID tuning of the copter.

   https://ardupilot.org/copter/docs/autotune.html

5. Set the following flight controller settings via the **Mission Planner** or **QGroundControl** application:

   5.1 SerialX_BAUD – 115200

   SerialX_PROTOCOL – MAVLink2

   where X - is the number of the TX, RX pin on the flight controller.

Serial4_BAUD	115200	Serial4 Baud Rate
Serial4_OPTIONS	0	Serial4 Options
Serial4_PROTOCOL	MAVLink2	Serial4 Protocol Selection

These parameters are responsible for connecting the flight controller to the companion computer.

5.2 WPNAV_ACCEL_Z – 500 sm/s/s

PSC_JERK_Z – 10 sm/s/s/s

WPNAV_SPEED_DN – 1500 cm/s

WPNAV_ACCEL_Z	500 sm/s/s	Waypoint Vertical Acceleration
PSC_JERK_Z	10 sm/s/s/s	Jerk Limit for The Vertical Kinematic Input Shaping
WPNAV_SPEED_DN	1500 cm/s	Waypoint Descent Speed Target

These parameters are responsible for the copter's descent speed in automatic flight mode.

5.3 Perform binding of RC_Channels for your transmitter (remote):

5.3.1 Set the **Stabilize** and **Guided_NoGPS** modes (copter automatic flight mode) to any convenient switch for the pilot.

5.3.2 Set the **Scripting1** mode (or code 300) to any convenient switch for the pilot. This switch will be responsible for switching between modes for targeting.

- *The position of the RC8* switch upwards (PWM signal 2011) –*
  will enable the automatic detection and capture of technique mode;
- *The position of the RC8* switch downwards (PWM signal 988) –*
  will enable the manual target capture mode.

* *The RC8 switch is given as an example. You can bind it to any convenient switch for the pilot.*

RC8_OPTION	Scripting1	RC Input Option

5.3.3 Set the **Scripting2** mode (or code 301) to any convenient button for the pilot on the transmitter.

- *When the Scripting1 switch is in the up position (PWM signal 2011),*
  this button will be responsible for switching the target for capture
  in the automatic technique detection mode;
- *When the Scripting1 switch is in the down position (PWM signal 988),*
  this button will be responsible for capturing the target
  in the white rectangle on the screen.

RC10_OPTION	Scripting2	RC Input Option

Operating Instructions

In automatic mode, the drone independently recognizes targets from a pre-loaded database.

The system is capable of identifying and distinguishing the following **types of targets**:

- infantry;
- civilian car;
- civilian bus;
- armored personnel carriers;
- tanks;
- MLRS;
- air defense systems;
- artillery systems.

In manual capture mode, the operator selects the zone of potential location of the object to be hit and enables autopilot, after which the pilot more precisely indicates the target using the sticks on the remote control. This mode is best applied for striking masked equipment, bunkers, and other structures that are absent from the system database.

In automatic mode, the drone is capable of recognizing targets located within the detector zone, which is marked on the screen with a green frame (Fig. 1). The detected object will be outlined on the screen with a blue frame (Fig. 2). If multiple objects are present in the detection zone, the operator switches between them using switch 2. To automatically strike the selected target, the pilot moves switch 1 to position 2. To disable the automatic target strike mode, switch 1 must be returned to position 1.

To capture a target **in manual mode**, switch 1 must be moved to position 3, after which the detector zone will appear on the screen, marked by a white rectangle (Fig. 3). The operator can change the detector's position (Fig. 4) using switch 3. To strike the target, the pilot must aim the detector at the target's location area and enable autopilot mode using switch 2.

With autopilot enabled, the operator performs a precise target search using the right stick on the remote control; for convenience, an enlarged image of the target location area is displayed in the upper right corner of the screen (Fig. 5).

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FIG. 1

FIG. 2

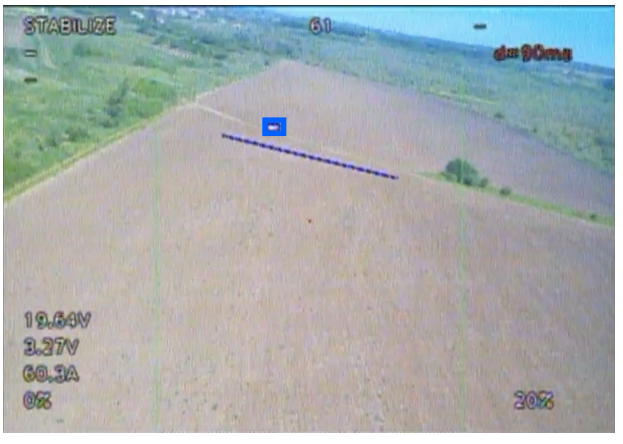

FIG. 3

FIG. 4

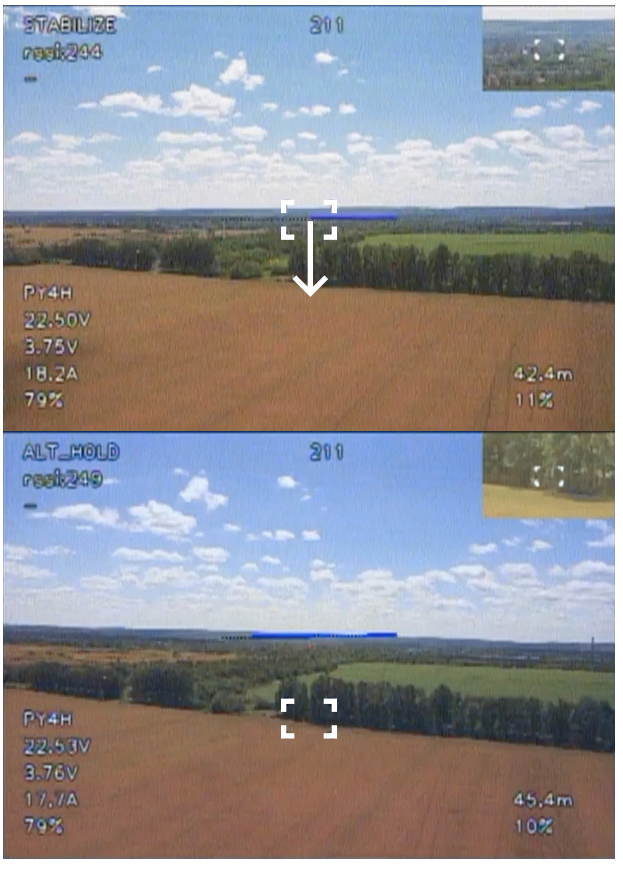

FIG. 5