H920 with ST16 and CGO3+

Flight mode settings for H920 (not for H920 Plus)

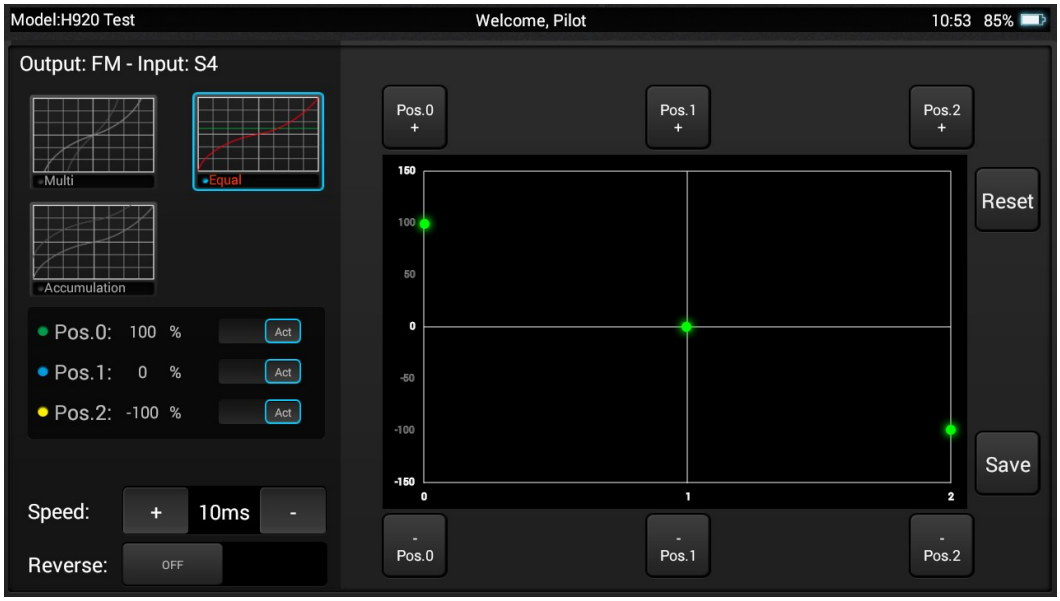
Create a new model based on H920.
Bind drone and camera to it.

Open Channel Settings (you must have Advance Mode at Other Settings enabled).

Tap on **Ch05/A01**. It must be connected with **S4**. **Flight Mode switch**

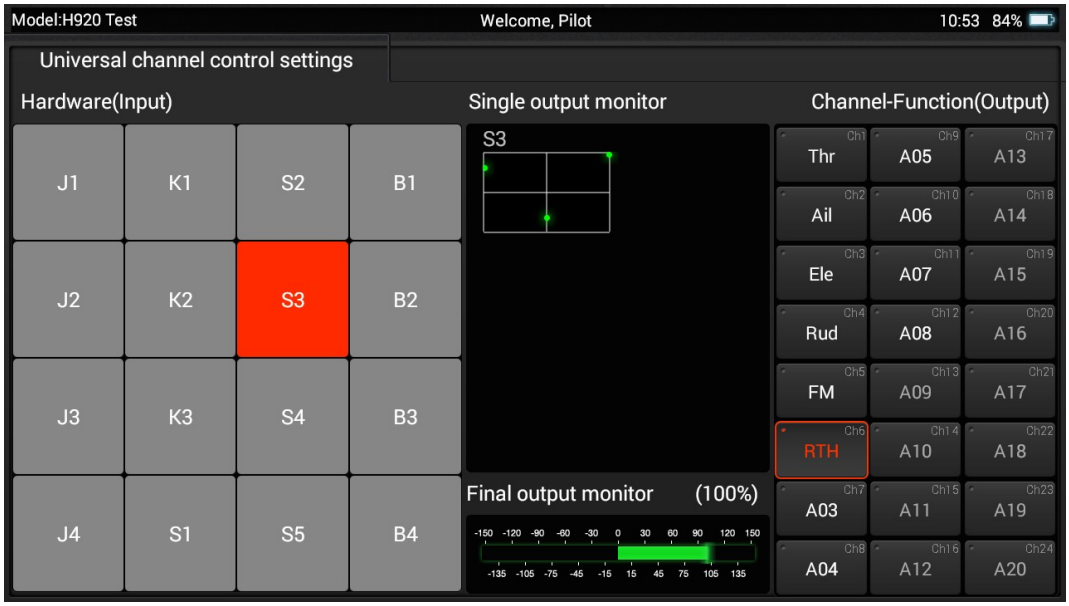
Tap long on **S4** > **Edit**:
Pos.0: 100% - Act
Pos.1: 0% - Act
Pos.2: -100% - Act

Smart Mode (green)
Angle Mode (purple)
Stability Mode (blue)



Save

Tap on **Ch06/A02**. Deactivate **S4** if connected to Ch06.

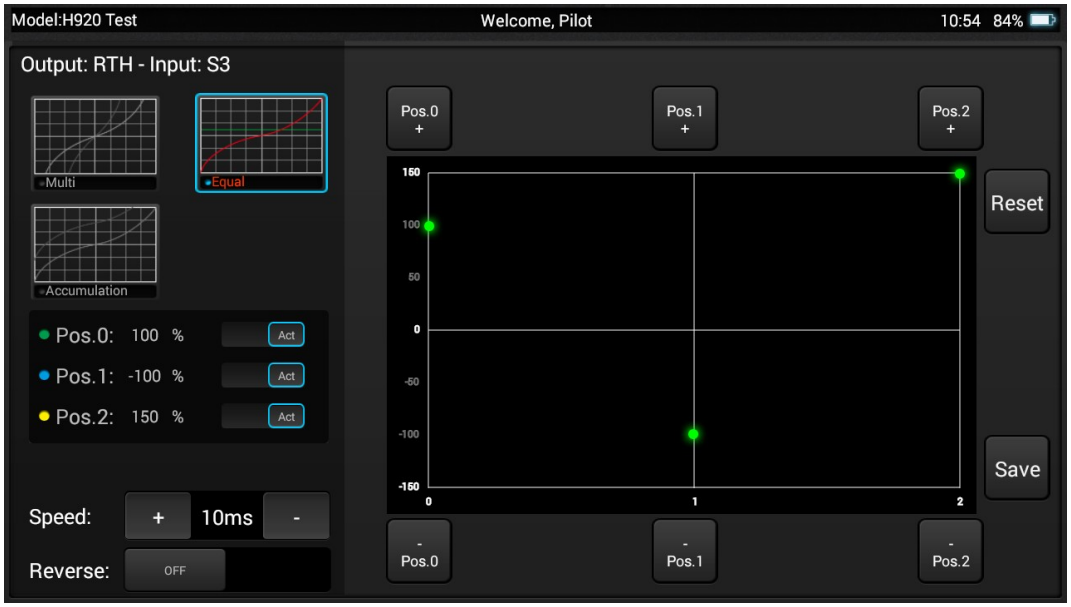


Tap **S3** > **Edit**.

Pos.0: 100% - Act
Pos.1: -100% - Act
Pos.2: +150% - Act

OBS switch (ignore OBS error messages)

With GPS (solid)
GPS off (purple blinking)
RTH (red blinking)



Save

Test the Flight Modes carefully.

Stabilty mode (blue LED) has no altitude hold! Throttle stick is really throttle, not altitude. Hold Trottle down when arm the drone!

CGO3+ control

This is the same setup as with the Thunderbird. Simply receive RC data messages from camera over WiFi, convert to gimbal control messages and send it to the gimbal via UART. To achieve this I use an ESP32 MCU board and two step-down converter, one for the camera (16V) and the second for the ESP32 (5V).

Code:

```
/*
This device acts as controller for the CGO3+ on Thunderbird with ST16.
The processor reads the WiFi channel data from ST16 and send following
data via control message to CGO3+:
- pan
- tilt
- pan mode
- tilt mode.
Camera control, settings, and video stream all using WiFi connection.

You need a power source for the camera 12-16V (VBAT, GND) and a step-down
converter to 5V (or 3.3V depending on ESP32 module type) for the ESP32.
CGO3_TXD2 to cam mRx/PWM
CGO3_RXD2 to cam mTx
Wiring depends on HW port definition below.
*/

#define AUX_PIN 22          // Built-in LED
#define CGO3_RXD2 16        // mTx/PWM  (black)
#define CGO3_TXD2 17        // mRx      (brown)
#define sendbuffer_size 36
#define UART_speed 115200
#define panmode_F 683       // Pan mode Fixed, camera points forward
#define panmode_A 830       // Pan mode Angle - camera points to angle depending knob: 0x033E
#define panmode_P 1502      // Pan mode Position
const uint16_t X25_INIT_CRC = 0xFFFF;
const byte FEheader = 0xFE;

byte cgo3buffer[47];
byte cgo3sequno = 0;

//
pan------ tilt-----       pan mode- tilt mode          CRC_l CRC_h
byte cgo3send_buffer[sendbuffer_size] = {0xFE,26,0,1,0,2,0,1,0,0,0,0,0,0,0,0,0,0,0x37,0,8,0,
0x00,0x08,0xAB,0x02, 0,8, 0xAB,0x02,0x88,0x08, 0xF4,1, 0x00, 0x00};

static inline void crc_accumulate(uint8_t data, uint16_t *crcAccum) {
  // Accumulate one byte of data into the CRC
  uint8_t tmp;
  tmp = data ^ (uint8_t)(*crcAccum &0xFF);
  tmp ^= (tmp<<4);
  *crcAccum = (*crcAccum>>8) ^ (tmp<<8) ^ (tmp <<3) ^ (tmp>>4);
}

uint16_t UpscaleTo150 (int val, bool convert = true) {                  // Scale 683 to 3412 (100%)
  if (convert) {
    val -= panmode_F;
    if (val < 0) {val = 0;}
    float val_asfloat = val * 4095.0 / 2729.0;                          // Scale 0 to 4095 (150%)
    val = round(val_asfloat);
  }
  return (val & 0x0FFF);                                                // 12bit per channel
}

void setup() {
  btStop();
//  Serial.begin(UART_speed);                                           // Debug
  Serial2.begin(UART_speed, SERIAL_8N1, CGO3_RXD2, CGO3_TXD2);          // Camera
  pinMode(AUX_PIN, OUTPUT);
  delay(100);
  digitalWrite(AUX_PIN, LOW);
}
```

```
void loop() {
  uint16_t crc16;
  uint16_t aux;
  byte cgo3len = 0;
  byte incomingByte;
  int numreadbytes;

  uint16_t panmode = panmode_F;

  if (Serial2.available() > 1) {
    incomingByte = Serial2.read();
    cgo3len = Serial2.peek();
    if ((incomingByte == FEheader) && (cgo3len == 38)) {    // Possible a message ChannelData 5GHz.
      numreadbytes = Serial2.readBytes(cgo3buffer, cgo3len+9);
      if ((cgo3len > 0) && (numreadbytes == cgo3len+9) &&  (cgo3buffer[2] == 4) && (cgo3buffer[6] ==
8)) {   // This SysID and Message ID contains channel data

// Read pan mode first, we need it later
        panmode = ((cgo3buffer[39] & 0x0F) << 8) + cgo3buffer[40];
        aux = ((cgo3buffer[36] & 0x0F) << 8) + cgo3buffer[37];          // 12 bytes per channel,
camera pan

// Change panmode Position to panmode Angle (like E90)
        if (panmode == panmode_P) {                                     // Optional: Change pan mode
to "Angle"
          panmode = panmode_A;
          aux = UpscaleTo150(aux);
        }
        cgo3send_buffer[22] = lowByte(aux);                             // Camera pan
        cgo3send_buffer[23] = highByte(aux);
        cgo3send_buffer[28] = lowByte(panmode);
        cgo3send_buffer[29] = highByte(panmode);

// Read and write tilt and tilt mode
        aux = (cgo3buffer[35] << 4) + (cgo3buffer[36] >> 4);            // Camera  tilt
        cgo3send_buffer[24] = lowByte(aux);
        cgo3send_buffer[25] = highByte(aux);
        aux = (cgo3buffer[38] << 4) + (cgo3buffer[39] >> 4);            // Camera  tilt mode
        cgo3send_buffer[30] = lowByte(aux);
        cgo3send_buffer[31] = highByte(aux);

        if ((cgo3buffer[42] & 0x0F) < 8) {                              // Optional: AUX button
channel 11
          digitalWrite(AUX_PIN, HIGH);
        } else {
          digitalWrite(AUX_PIN, LOW);
        }

// Prepare CGO3+ control message, add CRC16, and send it to camera
        cgo3send_buffer[2] = cgo3sequno;
        crc16 = 0xFFFF;
        for (uint8_t k=1; k<34; k++) {
          crc_accumulate(cgo3send_buffer[k], &crc16);
        }
        crc_accumulate(0, &crc16);
        cgo3send_buffer[34] = lowByte(crc16);
        cgo3send_buffer[35] = highByte(crc16);
        Serial2.write(cgo3send_buffer, sendbuffer_size);
        cgo3sequno++;
      }
    }
  }
}
```