

Co-Pilot™ II specifications

Operating voltage	+3.5 to +9 volts DC
Operating current	<10 milliamps (servos may draw more current from rapid movement and stabilization)
Weight	Computer: 0.61oz (19gm) Main Sensor Module: 0.23oz (7gm) Vertical Sensor Module: 0.16oz (5gm) IRNet Router: 0.26oz (8gm)
Sensor field of view	60° radius cone from window center line
Leveling response time	1/60th second
Drift from level	<2°
Flying conditions	Day and night; all weather conditions (rain, fog, sleet and snow may degrade performance)
Humidity	Sensor is sealed; keep windows clean
Remote activation	On/off control and selection of Flight Modes
Aircraft types	Works with all aircraft configurations, including dual aileron servos, quad flaps, elevons, V-tail, VTOL complex transmitter mixes, digital servos and CCPM

FMA limited warranty

FMA, Inc. warrants this product to be free of manufacturing defects for the term of 1 year from the date of purchase. Should any defects covered by this warranty occur, the product shall be repaired or replaced with a unit of equal performance by FMA or an authorized FMA service station.

Limits and exclusions

This warranty may be enforced only by the original purchaser, who uses this product in its original condition as purchased, in strict accordance with the product's instructions. Units returned for warranty service to an FMA service center will be accepted for service when shipped postpaid, with a copy of the original sales receipt or warranty registration form, to the service station designated by FMA.

This warranty does not apply to:

- Consequential or incidental losses resulting from the use of this product.
- Damage resulting from accident, misuse, abuse, neglect, electrical surges, reversed polarity on connectors, lightning or other acts of God.
- Damage from failure to follow instructions supplied with the product.
- Damage occurring during shipment of the product either to the customer or from the customer for service (claims must be presented to the carrier).
- Damage resulting from repair, adjustment, or any alteration of the product by anyone other than an authorized FMA technician.
- Installation or removal charges, or damage caused by improper installation or removal.

Call (301) 668-4280 for more information about service and warranty repairs.

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A detailed reference manual for this product, including feature explanations and flying tips, is available as a PDF at www.fmadirect.com/downloads.htm

Co-Pilot II Quick Start

Condensed instructions for installing and programming the Co-Pilot™ II Advanced Infrared Flight Stabilization System

Installing Co-Pilot II**Parts list**

- ☐ IRNet Programmer (Part no. IRNHP)
- ☐ IRNet Router (Part no. IRNRTR)
- ☐ Co-Pilot II Computer (Part No. CPII-CM)
- ☐ Main Sensor Module (Part no. CPII-MS)
- ☐ 3 heli boom mounts with double-sided adhesive (Part no. CPIISENMOUNT)
- ☐ 5 1"x1" double-sided adhesive strips (Part no. CPIITAPE)
- ☐ 6 6" nylon cable ties (Part no. NWT0.1x6)

Optional components

- ☐ Vertical Sensor Module (Part no. CPII-ZS)
- ☐ USB Interface Module (Part no. FUIM2 or FUIM3)

Other items you may need

- 3 AAA batteries (to power IRNet Programmer)
- Servo extension cables

Installing batteries in the Programmer

1. Remove four screws securing the back of the Programmer.
2. Insert three AAA batteries.
3. Replace the back of the Programmer and secure with four screws.

Before you start: Flight stabilization works with—and requires—a completely installed and correctly operating aircraft radio control system: transmitter, battery pack and servos. Install and set up your entire radio system before you connect Co-Pilot II to it. Be absolutely certain the radio system operates correctly and moves the control surfaces in the proper directions. Once the radio system is working correctly, then install and configure the Co-Pilot II system.

Co-Pilot is a trademark of FMA, Inc. U.S. Patent 6,181,989. Patents held in Germany and UK. Patents pending elsewhere.

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REVOLLECTRIX™

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Safety precautions

- Follow all instructions in this manual to assure safe operation.
- If you have not assembled and operated a radio controlled model before, obtain help from an experienced modeler. You will need guidance to successfully assemble, test and operate radio controlled models.
- Never fly radio controlled aircraft near people, buildings, telephone or power lines, cars, trees or other objects on the ground or in the air.
- Never allow a helicopter to fly within 20 feet of you or another person. If a helicopter flies toward you or another person, stop the engine or motor immediately to prevent personal injury.
- In many areas of the country, you cannot legally operate radio controlled models except at approved fields. Check with local authorities first.
- When using an FM or PCM transmitter, observe frequency control. If someone else is operating a radio controlled model on the same channel as your transmitter, **do not turn on your transmitter—even for a short time. For safety, most RC flying fields have formal frequency control rules. Follow them carefully.**
- Do not operate your FM or PCM radio control transmitter within 3 miles of another flying field. Even at a distance, your transmitter can cause interference.
- Co-Pilot™ II is designed for flight stabilization only. It cannot navigate the aircraft or prevent a stall. You must control the aircraft's flight path.
- Co-Pilot II is for recreational use only. Do not install it in aerial photographic aircraft where there is a possibility of flying over people.
- Mount the Main Sensor Module and optional Vertical Sensor Module securely. If a Sensor Module comes loose during a flight, the aircraft will crash.
- Keep fuel off the Sensor Modules. Fuel on the infrared sensors can affect Co-Pilot II operation for as long as 10 minutes.
- Besides your regular preflight check, also perform the Co-Pilot II preflight check before each flight.
- If you are not using the optional Vertical Sensor Module, perform a manual infrared calibration at the beginning of each flying session (via the "Do Field Calib." option in the Main Menu), and repeat the calibration if there are major weather changes.

Tip: None of the Co-Pilot II components are particularly susceptible to vibration. In many cases, the components can be mounted using double-sided adhesive tape.

Mounting the Main Sensor Module

General information

The Main Sensor Module can be mounted anywhere on the aircraft, as long as the following requirements are met:

- Must be horizontal when the aircraft is in level flight.
- Must be oriented so that two opposite infrared sensors are parallel with the longitudinal axis of the aircraft (i.e., directly fore and aft), or at 45° to the longitudinal axis.
- All infrared sensors must have a clear view of the horizon. E.g., if mounted directly behind a canopy, rotate Module so IR sensors are positioned 45° to aircraft's longitudinal axis.
- Must not be installed under a canopy or inside a cockpit (the infrared sensors cannot sense temperature differences through a canopy or plastic windows).
- Should be at least 6 inches from other components (including the Vertical Sensor Module, IRNet Router, digital servos, vertical stabilizer, horizontal stabilizer and landing gear) and at least 12 inches from engine and muffler.
- On fuel-powered aircraft, should be located where exhaust will not accumulate on the infrared sensors during flights.
- Must be mounted absolutely securely so it cannot move or come loose during flight. If the Main Sensor Module comes loose during flight, the aircraft may crash.

Additional mounting guidelines:

- Can be installed with label up (toward the sky) or down (toward the ground).
- Sensor orientation does not matter, as long as Module is parallel to or 45° to aircraft's longitudinal axis. Choose the orientation that has the most effective cable routing. The "Quick Setup" programming procedure will ask you about the Sensor's orientation.
- Use double-sided adhesive strips (included) or hook-and-loop fasteners (not included) to secure Module to wing or fuselage. Use the special heli mounts (included) to secure the Sensor to a helicopter boom (boom mounting details below).
- If needed, use a standard servo extension to connect Main Sensor Module to Computer.

- b. When the Programmer identifies the IRNet Router, the screen will show:

IRNet Router
Vx.x

- c. Simultaneously press the **DEC** and **ENTER** buttons. The screen may briefly show:

Searching...
for a Device

Note: If other IRNet devices are connected to the Router, you may see screens identifying them. Simultaneously press **DEC** and **ENTER** until you see the Co-Pilot II screen.

- d. When the Programmer identifies Co-Pilot II, the screen will show:

Co-Pilot II
Vx.xx

- e. Press the **ENTER** button to connect to the Co-Pilot II Computer. The screen will show the Main Menu:

CHOOSE TASK?
>[task]

5. Press **INC** or **DEC** to select a programming task—"Preflight," "Preferences" or "Quick Setup" (or "Do Field Calib." if the Vertical Sensor Module is not detected)—then press **ENTER** to view screens for that task.
6. If this is the first time accessing the Computer, navigate to "Quick Setup" and follow the on-screen instructions to configure Co-Pilot II.

The general approach to programming

- Use the "Quick Setup" screens to initially set up Co-Pilot II to work with the aircraft on which it is installed. Return to the "Quick Setup" screens if the sensor installation, radio system, servos or flight surfaces change. Also use "Quick Setup" to configure Flight Modes the first time.
- Use the "Preferences" screens to configure how Co-Pilot II operates. Also use "Preferences" to change Flight Modes without having to navigate all the screens in "Quick Setup."
- Use the "Preflight" screens to check Co-Pilot II, the receiver battery voltage, sky-to-ground temperature differential and other functions before each flight.
- If the Vertical Sensor Module is not installed, use the "Do Field Calib." screens to perform a manual infrared calibration at the beginning of each flying session, or whenever the weather changes significantly.

Tip: For help navigating the Programmer's screens, refer to the flowcharts in the Co-Pilot II Reference Manual (www.fmadirect.com/support_docs/item_1284.pdf) or the one-page flowchart (www.fmadirect.com/support_docs/item_1275.pdf).

Updating the Co-Pilot II Computer firmware

Note: Internet Explorer must be the default browser during this procedure.

1. Download the Co-Pilot II updater from www.fmadirect.com/downloads.htm
The updater should install automatically.
2. Launch the updater: **Start > Programs > FMA Direct > Co-Pilot II Update.**
3. Follow the on-screen instructions.

Programming Co-Pilot II

About the IRNet Programmer

The IRNet Programmer is your “window” on the Co-Pilot™ II system. It enables you to interact with the Computer to configure the system and assure it is working correctly. Programming covers a wide range of settings, organized in four areas accessed via the Main Menu:

- Preflight
- Preferences
- Quick Setup
- Do Field Calibration (available only if the Vertical Sensor Module is not detected)

Use the buttons on the Programmer to select options, adjust settings and move from screen to screen. In general, this is what each button does:

- **INC** (“increment”) selects the next Main Menu option or increases a value within a screen.
- **DEC** (“decrement”) selects the previous Main Menu option or decreases a value within a screen.
- **ENTER** moves to the next screen in a menu. If the current screen displayed a value you set, that value will be stored. If the current screen asks you to choose the next activity (using the **INC** and **DEC** buttons), pressing **ENTER** will display the screen for that activity.
- **BACK** moves to the previous screen. If the current screen displayed a value you set, that value will be stored.

Additionally:

- Press and hold the **BACK** button to move up one level in the menu structure.
- Simultaneously press **DEC** and **ENTER** to scan for IRNet devices (see next section).
- Simultaneously press **INC** and **BACK** to access the contrast adjustment screen. Press **INC** or **DEC** change contrast, then simultaneously press **INC** and **BACK** to exit.

Using the Programmer

1. Turn on the IRNet Programmer by pressing **ENTER**. The screen will show:

IRNet Display
Vx.x FMA Inc.

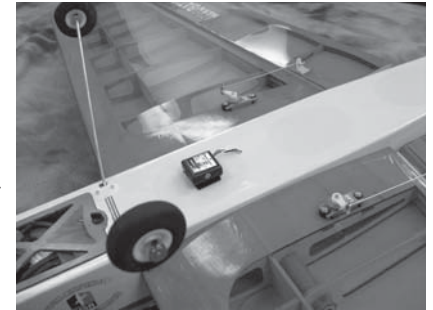
2. Turn on the Co-Pilot II Computer (by turning on the aircraft receiver).
3. In general, hold the IRNet programmer so its infrared transceiver can “see” the infrared transceiver on the IRNet Router, but be aware of the following:
 - The infrared transceivers are very powerful. Indoors, the signals will bounce off of floors, walls and ceilings.
 - Outdoors, especially in direct sunlight, range will be shortened and the Programmer will be more “directional”—it will need to be aimed more directly at the Router to get the best reception.
 - To prevent swamping, don’t aim the Programmer directly at the Router when the two are within 1-2 feet of one another.
4. Link up with the Co-Pilot II Computer:
 - a. Simultaneously press the **DEC** and **ENTER** buttons. The screen may briefly show:

Searching...
for a Device

Mounting on an airplane

Typical mounting locations for Main Sensor Module include top or bottom of fuselage, on top of wing of a high-wing airplane, or on bottom of wing of a low-wing airplane.

This photo shows the Main Sensor Module mounted on the bottom of the fuselage of an electric airplane. This would not be a good location on a fuel-powered airplane, as it would expose the Sensor to exhaust.



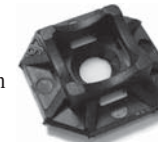
Main Sensor Module mounted on bottom of fuselage

Mounting on a helicopter

The best location for the Main Sensor Module is on top of the horizontal fin, rotated 45°. In this location and orientation, the IR sensors have the clearest view of the horizon. Sensors 2 and 3 should face forward so the cable routes forward along the boom. Secure the Main Sensor using double-sided tape (multiple layers may be needed to clear screw heads on top of the fin).

Alternatively, you can mount the Main Sensor on the tail boom, rotated 45°, using this procedure:

1. Cut corners from plastic mount.
2. Place double-sided tape on the boom, then place the plastic mount on the tape and secure it to the boom using a cable tie (the double-sided tape keeps the plastic mount from rotating).
3. Use double-sided tape to secure the Main Sensor Module to the plastic mount. The Sensor Module should be rotated 45° relative to the boom. Sensors 2 and 3 will face forward so the cable routes forward along the boom.



Main Sensor Module mounted on horizontal fin



Main Sensor Module mounted on helicopter boom

Tip: For additional security, feed cable ties through slots in bottom of Sensor’s case and around boom.

Mounting the Vertical Sensor Module

The Vertical Sensor Module can be mounted anywhere on the aircraft, as long as the following requirements are met:

- Must be vertical when the aircraft is in level flight.

IMPORTANT: Arrow on Vertical Sensor Module must point to sky when aircraft is in level flight. Failure to follow this precaution may result in unexpected results and a crash.

- Must be at least 6 inches from Main Sensor Module so Main Sensor Module’s IR sensors are not obstructed.
- On fuel-powered aircraft, should be at least 12 inches from engine and muffler, in a location where exhaust will not accumulate on IR sensors during flights.

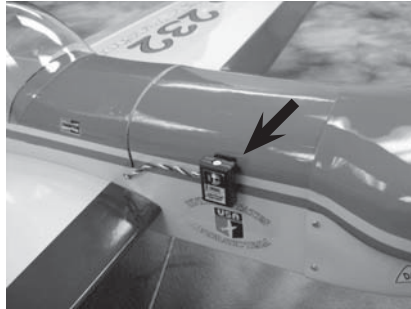
If needed, use a servo extension to connect Vertical Sensor Module to Computer.

continued

Mounting on an airplane

The Vertical Sensor Module is typically mounted on the side of the fuselage.

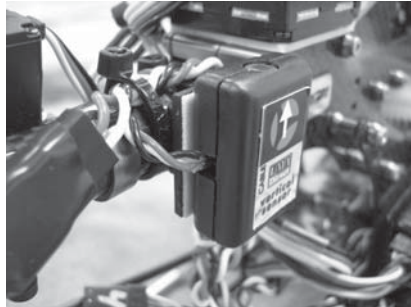
This photo shows the Vertical Sensor Module mounted on the right side of the fuselage, in front of the wing, on an electric airplane. This would not be a good location on a fuel-powered airplane, as it would expose the Sensor to exhaust.



Vertical Sensor Module mounted on fuselage side

Mounting on a helicopter

The Vertical Sensor Module is typically mounted on the boom, close to the body. Use an installation procedure similar to boom mounting for the Main Sensor Module. Alternatively, the Vertical Sensor Module can be attached to the helicopter frame or cockpit using the included double-sided adhesive strips.



Vertical Sensor Module mounted on helicopter boom

Mounting the IRNet Router

The IRNet Router can be mounted anywhere on the aircraft, as long as it does not obstruct the Sensors and it has line-of-sight communication with the IRNet Programmer during setup and pre-flight checks. If needed, use a standard servo extension to connect Router to Computer.

Tip: The IRNet Router is only required during system setup and preflight checks. If mounting or weight is a problem, it can be disconnected and left on the ground during flights. You will need to reconnect it to change settings or perform preflight checks.

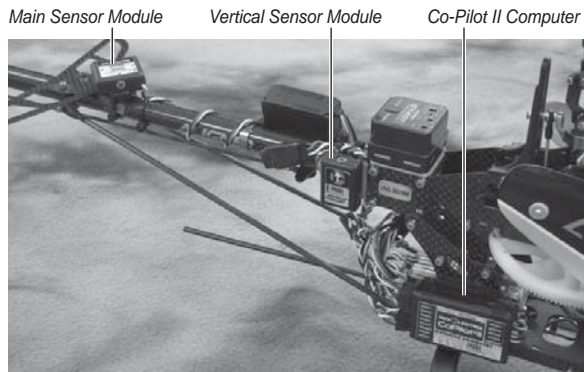
Mounting the Co-Pilot II Computer

Mount the Computer in a manner similar to your receiver.

Full helicopter installation

This photo shows how Co-Pilot components might be mounted on a helicopter. Your installation may be different from this.

Notice that in this installation, the Main Sensor Module is rotated 45° and mounted in the middle of the boom using the plastic mounting block. This is not the ideal location, as the IR sensors are partially blocked by the horizontal fin. The Vertical Sensor Module is mounted so that it has a clear view of the sky and ground.



Typical helicopter installation (the IRNet Router is mounted on the frame on the left side of the helicopter, and is not visible in this photo)

If helicopter channels are limited

As initially configured, many CCPM helicopter radio systems don't have a free channel for turning Co-Pilot II on/off and selecting Flight Modes. If your helicopter *doesn't* use four channels for flight stabilization (most helis use three servos for CCPM) *and* doesn't have enough channels for both gyro control and Co-Pilot on/off, there is a solution...

Once adjusted, a variable rate gyro doesn't need to be changed very often. If Co-Pilot II determines that only three channels are being used for CCPM, it can free up the receiver's gyro channel for on/off/Flight Mode use.

The simplified diagram below shows how the receiver would initially be set up to drive the gyro from an auxiliary channel. This arrangement enables you to adjust the gyro from the transmitter, and optimize its sensitivity before Co-Pilot II is connected into the system.



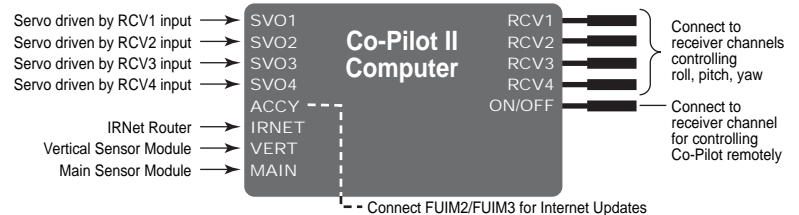
The next diagram shows how the Co-Pilot II Computer fits into the system. The auxiliary channel is used to control Co-Pilot through the Computer's ON/OFF input, while the Computer drives the gyro through its SV04 output. If you turn Co-Pilot II off, it continues to drive the gyro.



When you first program Co-Pilot II, you'll need to enter the gyro sensitivity setting (as a percentage) from your transmitter in the "Gyro Output Ch4" screen in the "Preferences" procedure. If you need to readjust the gyro later, just return to the "Preferences" screens.

Connecting the components (>> black or brown wires toward Computer's label <<)

In an airplane



In a helicopter

