TECHNICAL DOCUMENTATION

FPV Analog Video Scrambler & Descrambler Module

Datasheet & User Manual

Video Encryption / Decryption Board for Analog CVBS FPV Systems

36 × 36 mm board | **6.1 g** weight | **5–15 V DC** supply | **< 60 mA** @ 12 V | **CVBS** PAL / NTSC | **Seed 0–100000** | **< 0.1 ms** latency

Secure your analog video feed. Plug-and-play encryption for FPV drones, UAVs, CCTV and other analog video links — same PCB for both ends, configured by PC software.

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1. Product overview

The **FPV Analog Video Scrambler and Descrambler Module** is a compact board that encrypts and decrypts analog composite (CVBS) video. Installed between a camera and a video transmitter on the aircraft, and between a receiver and goggles/monitor on the ground, it prevents unauthorized viewers from recovering a usable picture from your radio video link.

The scrambler and descrambler use **identical hardware**. A PC configuration tool writes the operating mode (Scrambling or Descrambling), the video standard (PAL / NTSC) and the encryption seed into the board. The white **“S”** / **“D”** sticker on the module identifies the programmed function.

New FPV Analog video scrambler and descrambler module

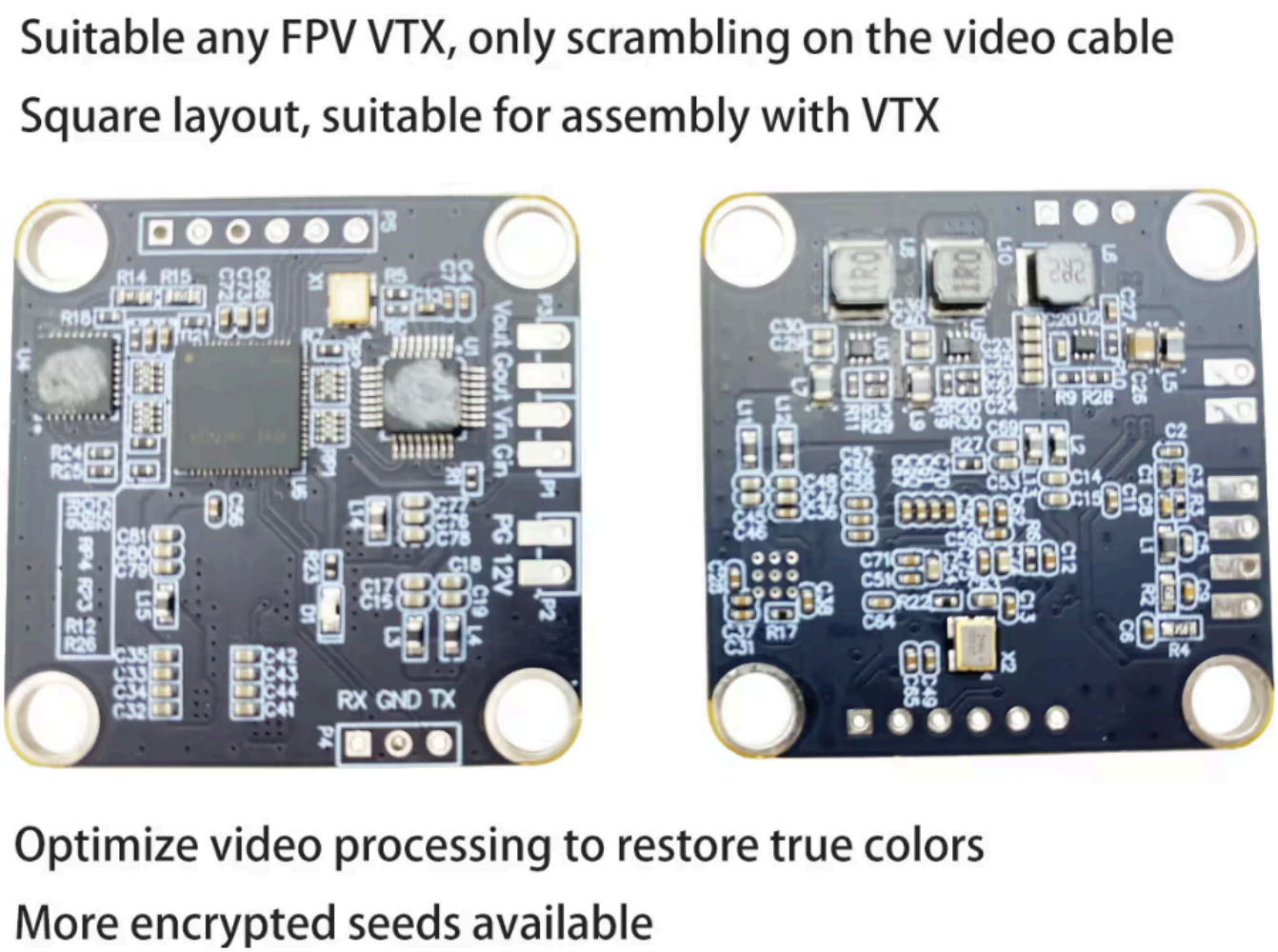


Fig. 1 — Scrambler / descrambler module (36 × 36 mm).

> **How it works.** The air-unit scrambler takes CVBS from the camera, distorts it with a user-selected scrambling algorithm and feeds the scrambled signal to the VTX. The VTX transmits it as a normal RF video carrier. The ground-unit descrambler receives that carrier from the VRX, restores the picture using the matching algorithm and outputs standard CVBS to goggles, a monitor or a DVR. A receiver with a different or default key shows only a scrambled image.

1.1 Key benefits

- **Secure video feed** — prevents unauthorized access to your analog video transmission.
- **Compact, powerful security** — 6.1 g, 36 × 36 mm; fits weight-critical FPV airframes.
- **Plug-and-play integration** — works with any analog FPV VTX; only the video cable is scrambled, no RF modification.
- **User-defined keys** — configurable seed instead of a fixed factory key, so same-brand receivers cannot automatically decode your feed.
- **Ultra-low latency** — typically less than 0.1 ms; real-time FPV flight experience preserved.

2. Features and advantages

- Suitable for any FPV VTX — scrambling is applied only on the video cable.
- Square 36 × 36 mm layout with four mounting holes; suitable for direct assembly with VTX boards.
- Optimized video processing restores true colors after descrambling.
- More encryption seeds available — configurable via the PC tool.
- Faster response time and enhanced anti-interference.
- More stable firmware, reducing the probability of firmware loss.
- Same PCB for scrambler and descrambler — simplifies stock and spares.

For an even smaller setup that fits inside FPV goggles, a miniaturized variant is available on request.

3. Technical specifications

Parameter	Specification
Module type	Identical PCB, programmed as scrambler (“S”) or descrambler (“D”)
Video signal	Analog composite video (CVBS), standard definition, approx. 480p–576p
Video standard	PAL / NTSC, selectable in the configuration software
Audio encryption	Not supported — video only
RF compatibility	Independent of RF band; works with 5.8 GHz, 2.4 GHz, 1.2 GHz and other analog FPV VTX/VRX systems
Supply voltage	5–15 V DC typical (board marked 12 V; product page also notes 6–16 V). Operation below 5 V may cause abnormal behavior
Current consumption	Less than 60 mA (typical 12 V @ 60 mA)
Encryption seed	User-selectable 0–100000 in software; factory default algorithm 7679
Seed availability note	The 100000-seed algorithm applies only to boards newly produced from March 2025. Delivery is random — state special requirements when ordering. The FAQ also refers to “over 130,000 encryption algorithms” on latest-version modules
Added latency	Negligible, typically < 0.1 ms
Board size	3.6 × 3.6 cm (36 × 36 mm), four corner mounting holes
Weight	6.1 g (scale photo reads 6.01 g)
Status indicator	LED flashing = normal operation; LED permanently on = self-diagnosis failure / malfunction
Firmware upgrade	Not user-upgradeable. Damaged firmware/IC requires factory repair or replacement board
Environmental	Not waterproof — use an enclosure for outdoor or drone installation
Certification	No certification applied for (special customized product)
Range	Determined by the VTX / power amplifier; the scrambler does not reduce transmission distance

4. Mechanical data

4.1 Board size

Board outline: **36 × 36 mm** (3.6 × 3.6 cm), square format with one mounting hole at each corner. The compact square form factor allows the module to be stacked or mounted directly beside a VTX inside a drone.

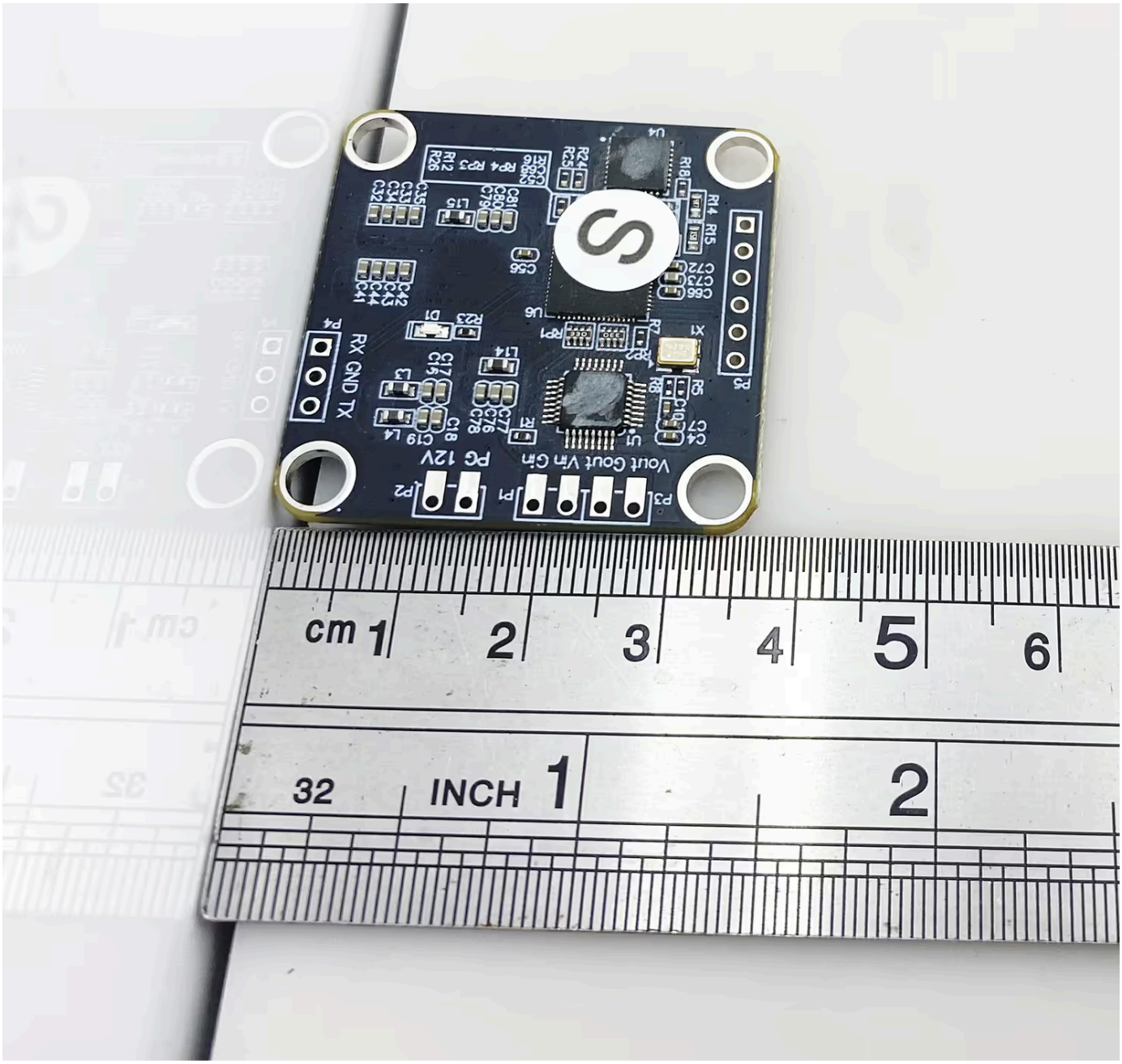


Fig. 2 — Board-size measurement against a ruler: 3.6 × 3.6 cm.

4.2 Weight

Measured weight is **6.1 g** per module (scale photo reads 6.01 g) — light enough for weight-critical FPV airframes and multi-rotor builds.



Fig. 3 — Module weight: 6.1 g (scale reading 6.01 g).

4.3 Scrambler and descrambler hardware

Both functions use the same PCB and component layout. The white “S” / “D” sticker and the programmed firmware are the only differences.

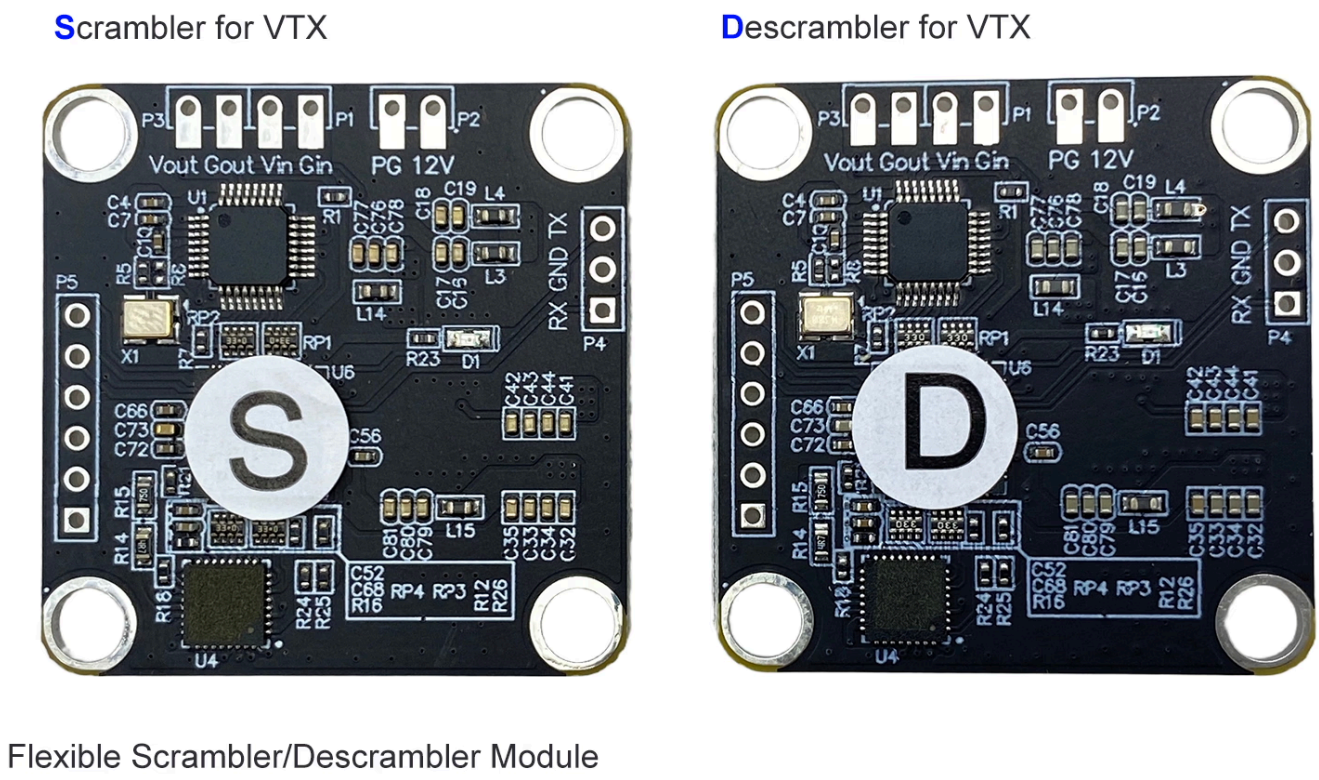


Fig. 4 — Identical hardware. Left: “S” scrambler for VTX; right: “D” descrambler for VRX.

> Keep one of each for a complete air/ground link — one pair = one scrambler for the air VTX + one descrambler for the ground VRX. Ordering two of the same type will not build a working encrypted link.

5. Connectors, pin-out and wiring

5.1 Board connectors and pin definition

The pin numbering below follows the interface diagram. Power is on P2, video input on P1, video output on P3, TTL serial on P4, and P5 is reserved for engineering/debug use.

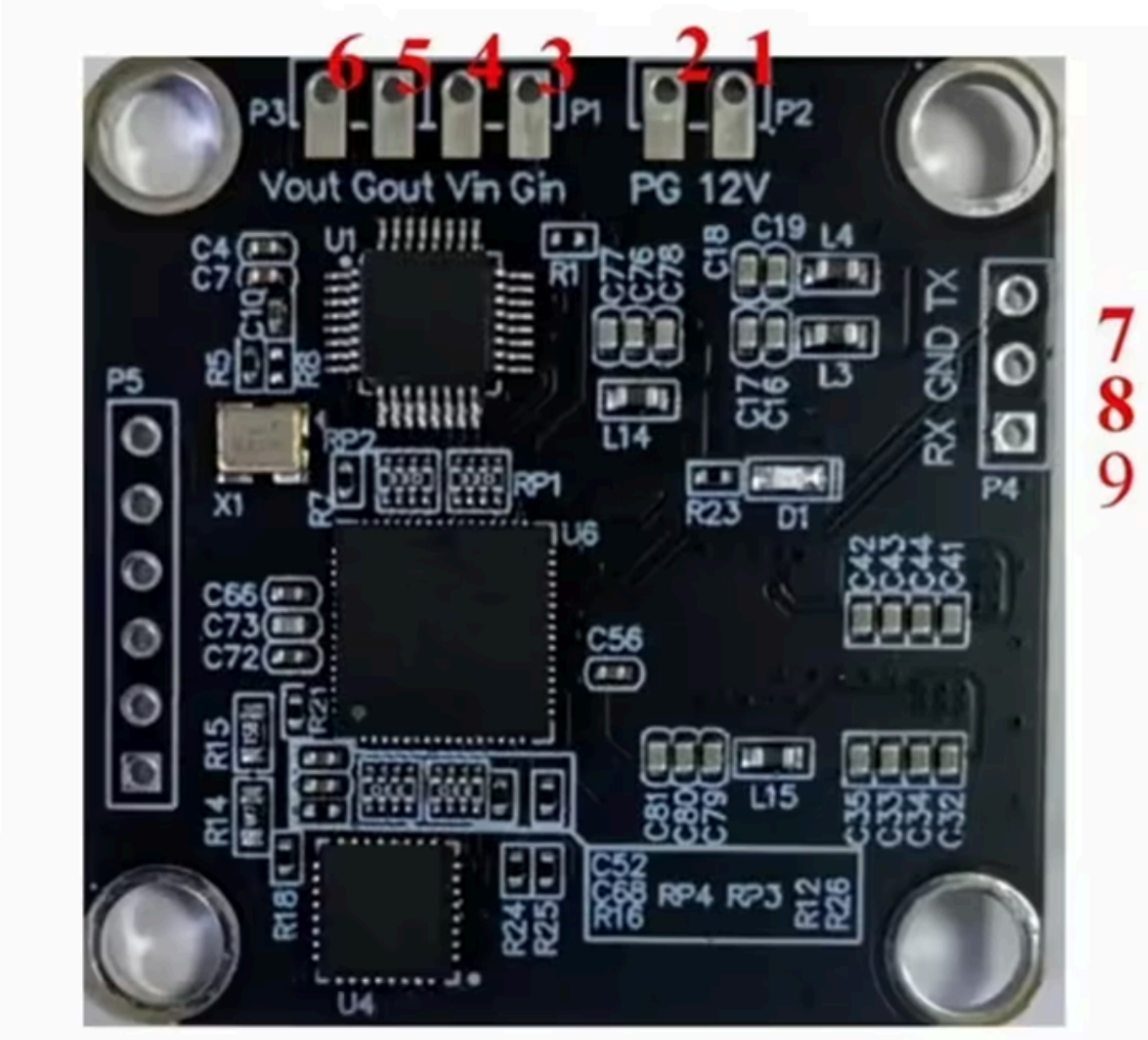


Fig. 5 — Board connector layout and pin definition.

5.1.1 Pin description table

Pin	Connector	Name	Function
1	P2	12V / VCC	DC power input, 5–15 V (nominal 12 V)
2	P2	PG / GND	Power ground
3	P1	Gin	Video input ground
4	P1	Vin	Video input (camera CVBS). On the ground unit this is the VRX video output
5	P3	Gout	Video output ground
6	P3	Vout	Video output: to VTX on the air unit; to display / VR / monitor on the ground unit
7	P4	TXD	TTL serial transmit — connect to USB-TTL adapter RXD
8	P4	GND	Serial ground — common with module ground
9	P4	RXD	TTL serial receive — connect to USB-TTL adapter TXD
—	P5	DEBUG	5-pin engineering interface for debugging; leave unconnected in normal use

> **Power caution:** supply 5–15 V DC (12 V nominal). Voltages below 5 V may cause abnormal operation. Observe polarity — pin 1 is positive, pin 2 is ground.

5.2 Air unit (scrambler) wiring

1. Camera CVBS video output → **P1 Vin (pin 4)**; camera ground → **P1 Gin (pin 3)**.
2. DC supply (5–15 V) → **P2 pin 1**; supply ground → **P2 pin 2**. The module may share the VTX supply if the voltage is within range and current budget (< 60 mA).
3. **P3 Vout (pin 6)** → VTX video input; **P3 Gout (pin 5)** → VTX video ground.
4. Power the system. The VTX now transmits an encrypted picture over the original RF band.

5.3 Ground unit (descrambler) wiring

1. VRX CVBS video output → **P1 Vin (pin 4)**; VRX ground → **P1 Gin (pin 3)**.
2. DC supply → **P2 pins 1 / 2**.
3. **P3 Vout (pin 6)** → goggles / monitor / DVR video input; **P3 Gout (pin 5)** → video ground.
4. Configure the same seed and PAL/NTSC standard as the air unit; the original picture is restored.

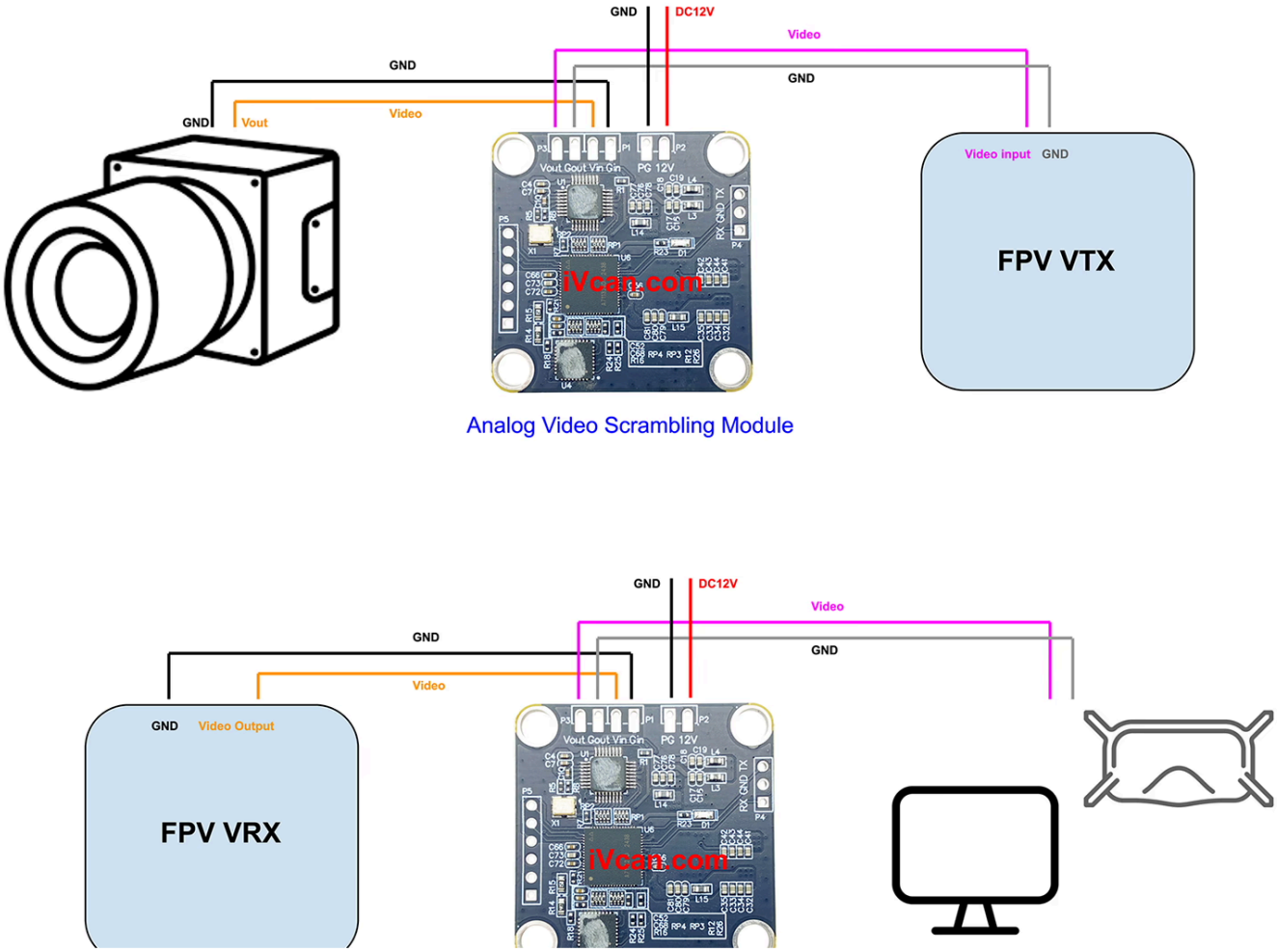


Fig. 6 — System connection: camera → scrambler → FPV VTX (top); FPV VRX → descrambler → monitor / goggles (bottom).

5.4 Example wiring with RCA leads

The photo below shows a matched scrambler/descrambler pair wired with RCA video leads and a separate DC supply lead. Yellow RCA plugs carry CVBS video; the black connector carries power.

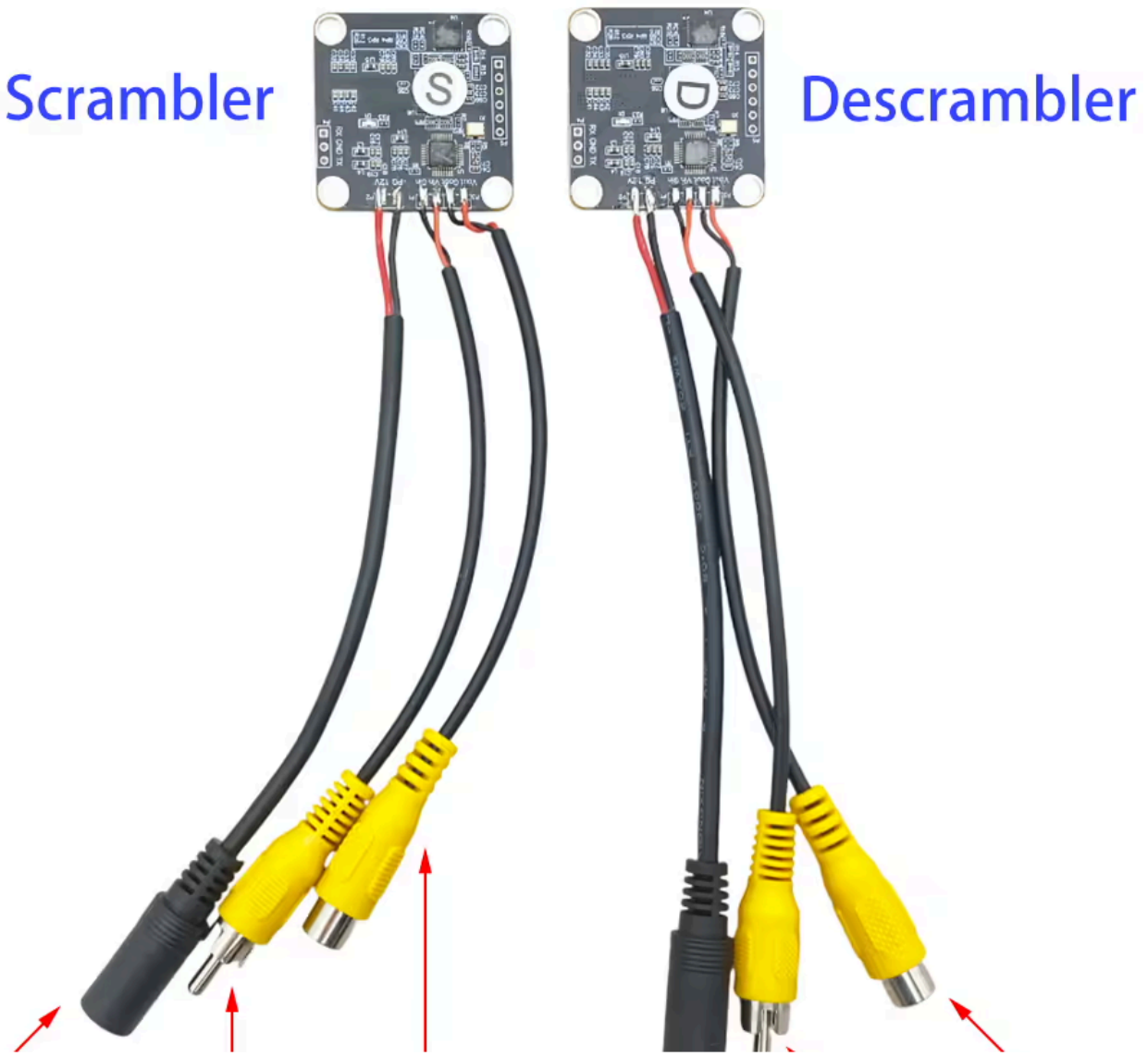


Fig. 7 — Example wiring with RCA video leads: scrambler (left) and descrambler (right).

> The module works on the **video layer** only. It does not care which RF frequency the VTX uses, does not provide frequency hopping itself, and does not suppress RF interference or jamming.

6. Configuration software

Software: FPV Video Scrambler Configuration Software — *CVBS Scrambling Assistant 2.1*. Use it to set the module as an Air Unit (scrambling) or Ground Unit (descrambling), choose PAL/NTSC, write the encryption seed, and read back the current settings.

Download:
https://drive.google.com/file/d/1xnnLITVIT-0ZVc0wamZffsirkuGsceGO/view?usp=drive_link

6.1 PC connection

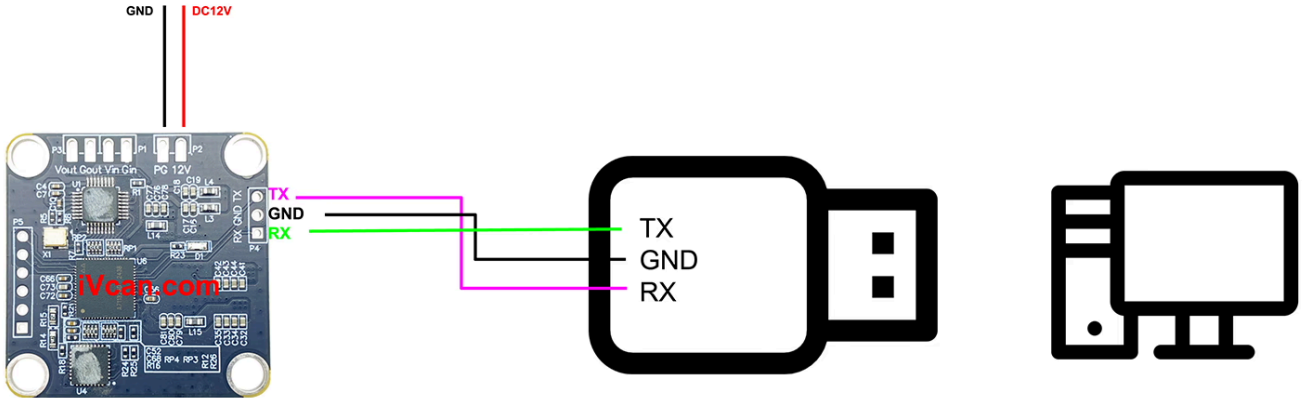


Fig. 8 — Programming connection: module P4 TTL pins to a USB-TTL adapter, then to a PC.

1. Power the module from a suitable 5–15 V DC supply (or through the connected system).
2. Connect a USB-TTL (serial) adapter: module **TXD** → **adapter RXD**, module **RXD** → **adapter TXD**, and **GND** → **GND**. TX/RX must be crossed.
3. Install the USB-TTL driver if prompted, then note the COM port number in Windows Device Manager.

6.2 Software settings

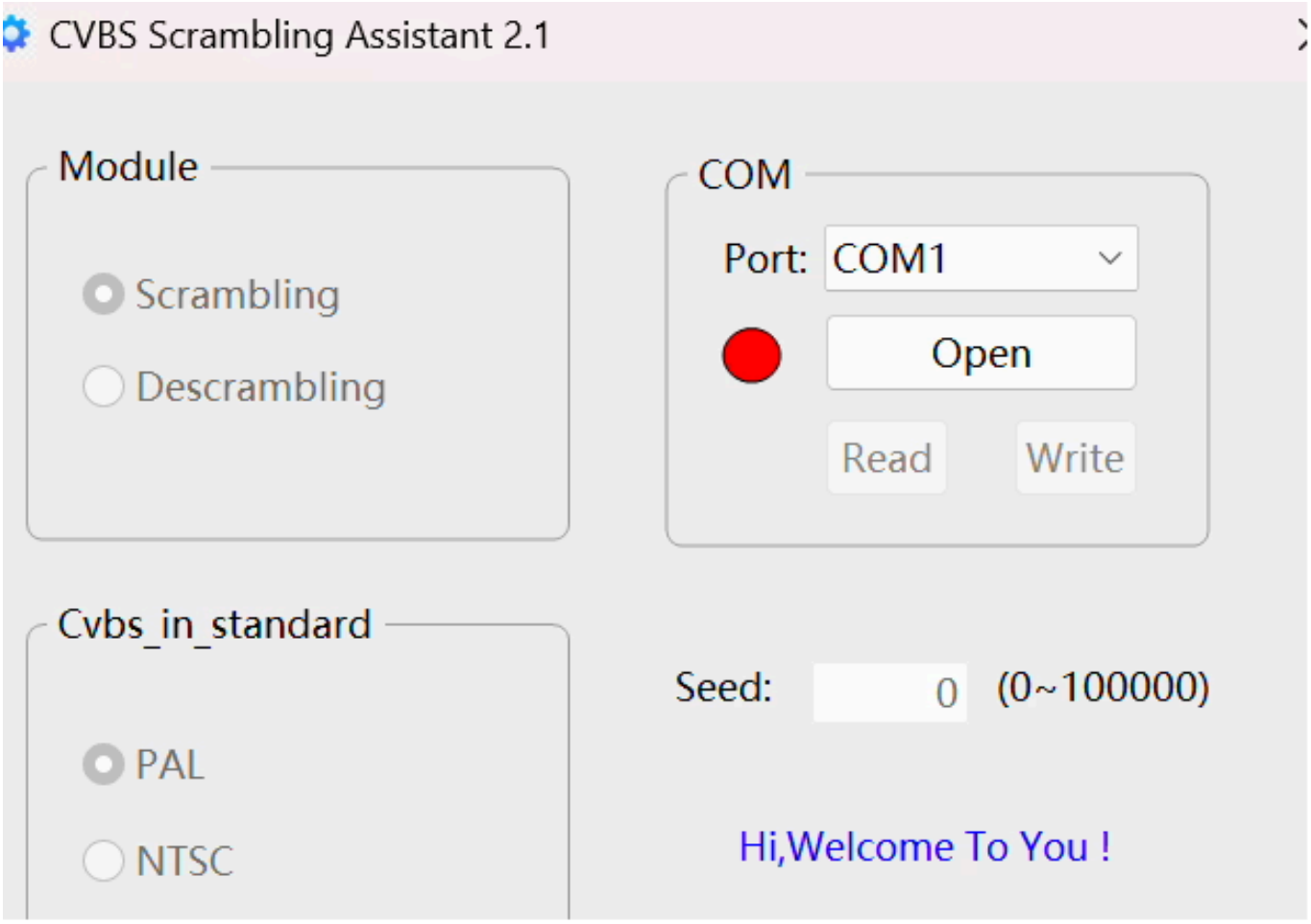


Fig. 9 — CVBS Scrambling Assistant 2.1: Module mode, COM port, video standard and seed settings.

Control	Setting
Module	**Scrambling** = air unit / VTX; **Descrambling** = ground unit / VRX
COM — Port	Select the COM port of the USB-TTL adapter (example in screenshot: COM1)
COM — Open	Open the serial connection; the red indicator shows link status
Read	Read current mode, standard and seed from the module
Write	Write the selected settings into the module
Cvbs_in_standard	**PAL** or **NTSC** — must match the camera and the other end of the link
Seed	Enter a value in the range **0–100000** (screenshot shows 0). This is the scrambling / descrambling key

6.3 Configuration procedure

1. Open the software and select the correct COM port; click **Open**.
2. Select **Scrambling** for the air module, **Descrambling** for the ground module.
3. Select **PAL** or **NTSC** to match your camera and display system.
4. Enter the same **seed** on both modules. The factory default algorithm/seed is **7679**; both boards are delivered with the same default “12345” password, so change it before deployment.
5. Click **Write**. Then click **Read** to verify the stored settings.
6. Disconnect the USB-TTL adapter and install the module in the air/ground system.

6.4 Seed availability & verification notes

> **Important:** the 100000-seed algorithm is only available on newly produced boards from March 2025. Stock delivery may use the default 7679 algorithm. If a specific seed/algorithm is required, note it on the purchase order. Different seeds on the two ends will produce a scrambled picture on the ground display.

- After writing, click **Read** and confirm the displayed mode, video standard and seed match the intended values.
- Write the **same seed** to the air and ground modules. A mismatch is the most common cause of a scrambled ground picture.
- The PAL/NTSC setting must match the camera output and the ground display standard.
- Keep a record of the assigned seed for each aircraft when operating multiple drones.
- Disconnect the USB-TTL adapter before flight; P4 is intended for configuration only.

Contact your supplier for technical support and configuration assistance.

7. Operation and diagnostics

Symptom / check	Meaning & action
LED indicator flashing after power-on	Normal operation — self-diagnosis passed
LED indicator constantly on	Self-diagnosis failed / malfunction. Check supply voltage and wiring; contact your supplier if it persists
Ground screen shows rolling/scrambled bars	Seed mismatch, wrong PAL/NTSC standard, or the picture is unauthorised. Re-read both modules and write identical settings
No picture at all	Check Vin/Gin video connections, VTX/VRX link, power polarity and 5–15 V supply
Colors look unnatural	Confirm video standard; the module optimizes color restoration — verify camera output is standard CVBS
Firmware lost / board damaged	Not field-upgradeable — return to factory for chip replacement or obtain a new board

Startup sequence: power the air unit and ground unit, confirm both LEDs flash, then verify a clear live picture on the ground display. For multi-drone operations, assign a different seed to each aircraft to keep feeds exclusive.

8. Security performance

Compared with common FPV scramblers that use fixed encryption seeds, this module supports user-defined scrambling algorithms and multiple seeds. Only a receiver configured with the matching key restores the image; a mismatched — or same-brand but differently keyed — receiver sees only noise.



Fig. 10 — With other-brand scramblers, anyone with a compatible receiver (e.g. HiddenFPV) can still access the feed.

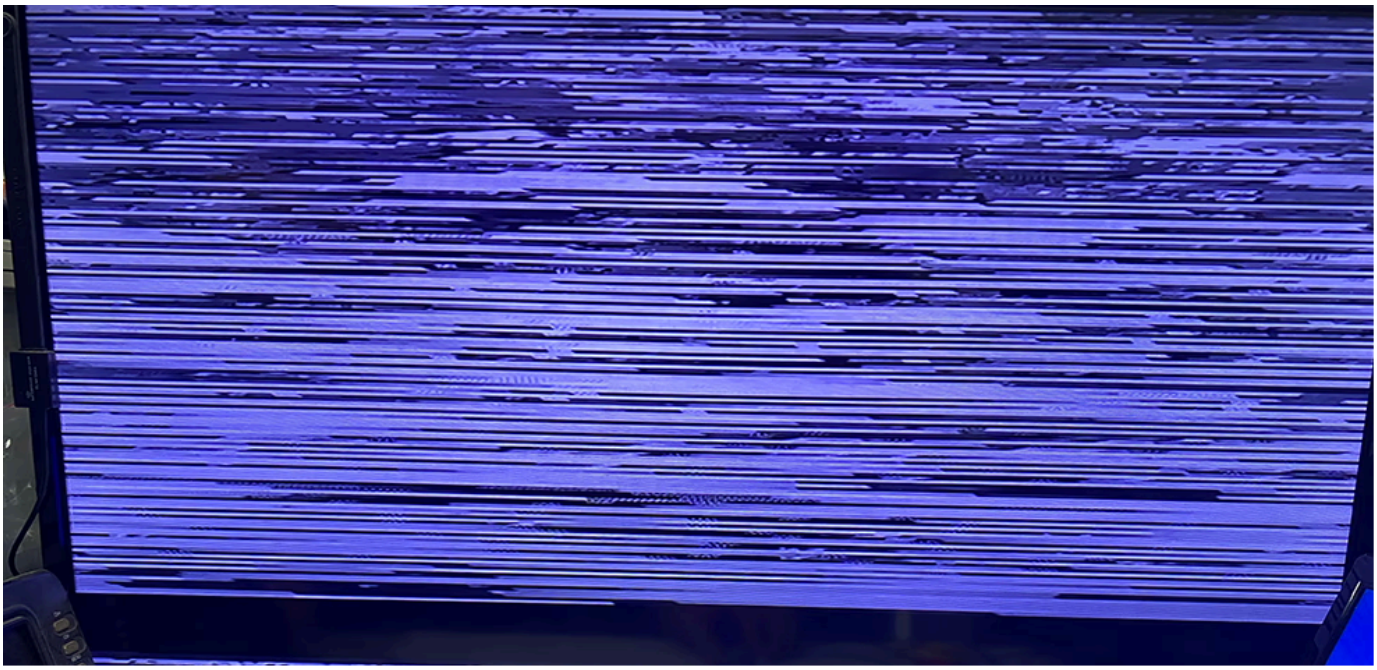


Fig. 11 — Display seen by a user without the correct descrambling key: video is unreadable.

8.1 Limits of protection

Encryption protects privacy, **not** against RF jamming. For anti-interference requirements, use a separate anti-jamming solution. Audio is not encrypted by this module.

- The scrambler operates on the CVBS video layer and does not change transmit frequency, power or modulation.
- It does not add frequency hopping by itself — hopping depends on the FPV VTX.
- Range is unchanged: encrypted video travels as far as the VTX and antenna system allow.
- Only viewers with the matching seed and correct video standard recover a usable picture; all others see an unreadable scrambled image.
- For critical deployments, use a unique seed per aircraft and change the factory default password before operation.

> Video quality after descrambling remains close to the original analog signal with minimal distortion when the decryption settings are configured correctly.

9. Package contents

Typical shipment includes the scrambling/descrambling module(s), a USB serial port tool, Dupont connecting wires and anti-static gloves. Confirm the exact quantity configuration of your order.

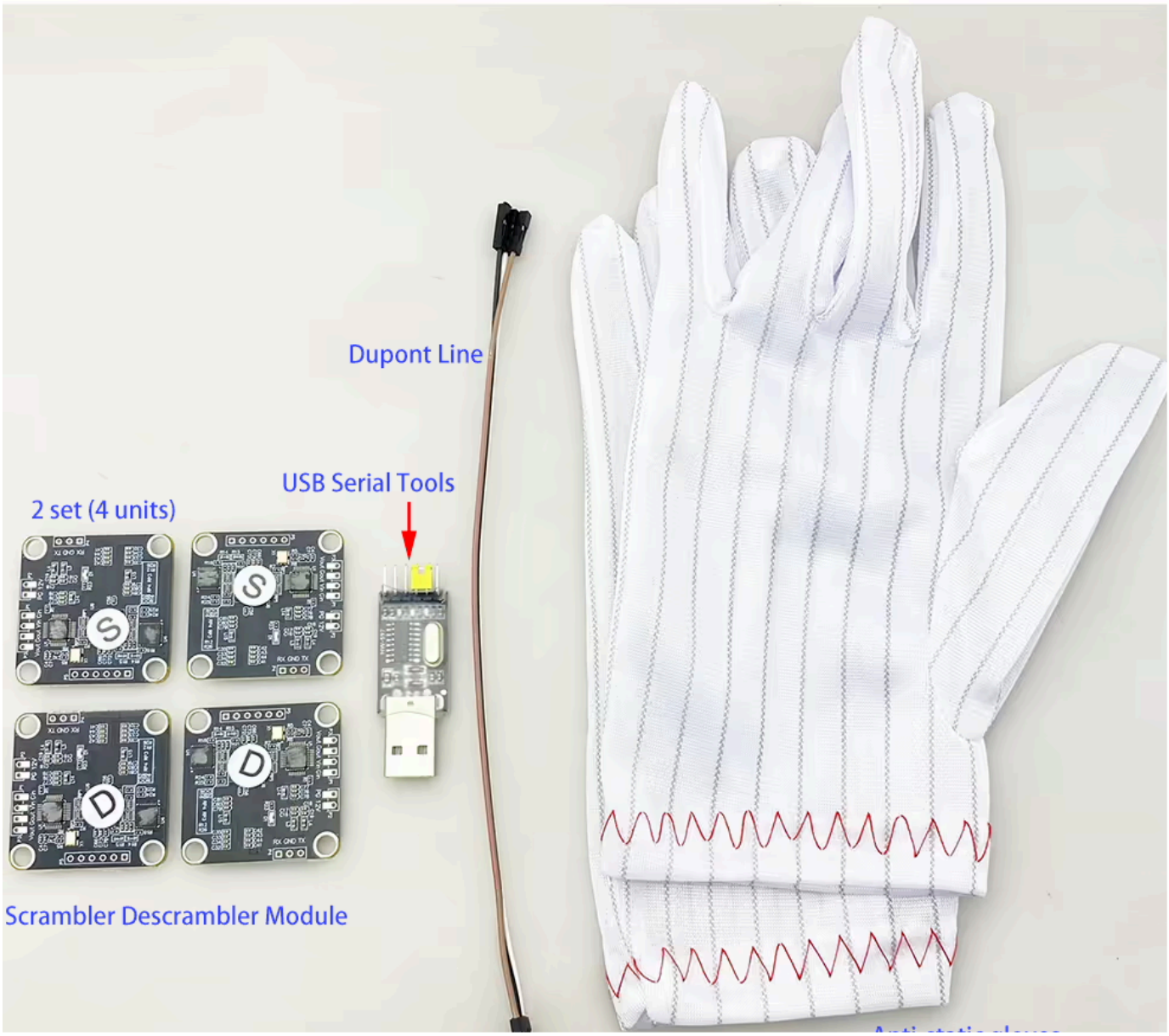


Fig. 12 — Package contents: scrambler/descrambler modules, USB serial tool, Dupont line and anti-static gloves.

9.1 Packed shipment weight

The packed kit is light enough for sample shipping by air. The exact gross weight depends on the number of modules and accessories in your order; confirm with sales for shipping quotations.



Fig. 13 — Packed shipment on a scale (photo reading approx. 100 g).

10. Applications

- FPV drone racing — protect live feeds from unauthorized viewers
- Security and surveillance drones
- Military / defense UAV reconnaissance links
- Industrial inspection of critical infrastructure
- Private aerial filming and broadcasting
- Government / law-enforcement surveillance
- Border patrol, wildlife and remote area monitoring
- Analog CCTV feed protection
- FPV education and secure-video research projects
- Long-range FPV systems (range set by VTX)

10.1 Customizable options (OEM / ODM)

Custom encryption algorithm (line inversion, phase shift or advanced analog encryption), descrambling key, CVBS / PAL / NTSC input and output type, operating voltage (e.g. 5.5 V, 12 V, 6–16 V), PCB size and form factor, latency optimization, RF band compatibility, multiple scrambled channels, power consumption, connector type (JST, SMA, RCA), custom firmware, waterproof / dustproof protection, status LEDs, and integration with other FPV modules. Lead time for bulk/custom orders: typically 2–4 weeks.

11. FAQ (selected)

#	Question	Answer
1	What is it?	A hardware board that encrypts/decrypts analog FPV video between transmitter and receiver.
2	How does it work?	The scrambler distorts the video with an encryption algorithm; without a matching descrambler the receiver cannot form a picture.
3	Which encryption?	Frequency inversion, line inversion and video encryption algorithms are applied to the analog CVBS feed.
4	Camera compatibility?	Yes — most analog FPV cameras with standard CVBS output.
5	Latency?	Negligible, less than 0.1 ms.
6	Frequency range?	Any analog video frequency — 5.8 / 2.4 / 1.2 GHz etc. The module works on the video signal, not the RF carrier.
7	NTSC / PAL?	Both, selected in the CVBS Scrambling Assistant software.
8	Power?	Typically 12 V @ 60 mA; operating range 5–15 V.
9	Encryption complexity?	Latest-version modules offer a large number of algorithms (website states over 130,000); software seed field is 0–100000.
10	Main applications?	FPV drones, UAVs, tactical communication and private video feeds.
11	Long range?	Yes — up to several kilometres depending on VTX and amplifier; the scrambler does not reduce range.
12	How to connect?	Camera CVBS out → scrambler input → VTX; VRX → descrambler → goggles / monitor.
13	Different keys per drone?	Yes — set a different seed for each aircraft.
14	Video quality?	Close to the original analog signal with minimal distortion when decryption is configured correctly.
15	Weight?	6.1 g.
16	CCTV use?	Yes — protects analog CCTV feeds against interception.
17	Plug and play?	Yes with simple wiring; both module types share the default “12345” password — connect to a PC to modify it.
18	Audio encryption?	No.
19	Voltage?	DC 5 V or 12 V, compatible with common FPV gear.
20	Custom key?	Yes — via CVBS Scrambling Assistant configuration software.
21	Analog vs digital scrambler?	Analog encrypts composite CVBS; digital handles HDMI/SDI/IP. Digital video links with built-in AES128 need no extra scramble module.
22	Jamming protection?	No — it encrypts video, not the RF link.
23	Goggles compatibility?	Any analog FPV goggles or monitor accepting standard CVBS.
24	Waterproof?	No — additional housing required for outdoor use.
25	Firmware upgrade?	Not currently supported; factory service required.
26	OEM integration?	Yes — OEM versions for custom PCB integration.
27	Board connectors?	Pin headers for video/power (RCA-style leads available); see Section 5.
28	Can it be cracked?	Properly implemented scrambling is difficult to decode without the matching key/hardware.

#	Question	Answer
29	Technical support?	Contact your supplier for support.
30	Lead time / custom version?	2–4 weeks depending on quantity and customization; OEM/ODM available.

12. Ordering information

Unit price	USD 29 per module (shipping cost included, per product page)
Pair price	USD 58 per pair — one scrambler for air VTX + one descrambler for ground VRX
Software download	FPV Video Scrambler Configuration Software