

Microphone Array 360 Degree Detection & Recognition System

Technical Datasheet

Acoustic + Electro-Optical Integrated Perception System

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Product Model 8026F + CGTX80E Integrated System

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1. Product Overview

1.1 System Introduction

The Microphone Array 360 Degree Detection & Recognition System is a composite target perception system that integrates acoustic detection with electro-optical recognition. The system employs the 8026F large microphone array as the acoustic sensing front-end, paired with the CGTX80E tactical-grade micro three-axis dual-sensor inertial-stabilized EO/IR gimbal, enabling 360-degree omnidirectional acquisition of ambient acoustic signals, beamforming, acoustic source localization, and sound imaging visualization. The EO gimbal provides visible-light/infrared dual-spectral target confirmation, laser ranging, and automatic tracking. The system is suitable for low-slow-small UAV detection, mechanical anomaly acoustic diagnosis, environmental noise monitoring, and security surveillance applications.

1.2 Application Scenarios

- Sound Imaging Visualization: Provides an intuitive view of sound distribution throughout the entire space, with acoustic heatmaps and beam direction display.
- Acoustic Source Localization: Identifies mechanical abnormalities, honking sounds, and environmental noises within the audible range, with precise azimuth localization.
- UAV Detection and Tracking: Acoustic detection and localization of "low, small, slow" targets (such as surveillance drones and unlicensed drones), with EO gimbal integration for visual confirmation and continuous tracking.

2. System Components

2.1 Acoustic Detection Module (8026F Microphone Array)

The 8026F large microphone array adopts a multi-arm spiral arrangement with 128 high-sensitivity microphone channels and an array aperture of 460 mm. It supports wideband acoustic acquisition from 20 Hz to 80 kHz. Based on an FPGA real-time processing platform, it can simultaneously form up to 16 independent beams, outputting XY coordinates, azimuth angle, and pitch angle with a positioning accuracy of $\pm 2\%$. The positioning distance covers 0.1 to 5000 meters (depending on sound intensity). The array integrates a 1080P/720P camera for synchronized video capture with acoustic beam overlay.

2.2 Electro-Optical Detection Module (CGTX80E 3-Axis EO/IR Gimbal)

The CGTX80E is a tactical-grade micro three-axis dual-sensor inertial-stabilized EO/IR gimbal. It integrates a 35 mm uncooled long-wave infrared thermal imager and a 2 MP visible-light camera, and is equipped with a laser rangefinder for target position measurement, featuring autonomous target detection, recognition, lock-on and tracking. With gyro stabilization accuracy of ≤ 0.1 degrees, it delivers stable and clear EO imagery on moving platforms. When integrated with the acoustic array, it completes the full detection chain: "Acoustic Detection -> EO Confirmation -> Laser Ranging -> Auto Tracking".

EO Gimbal Component Identification:

- 1. External Interface
- 2. Azimuth Axis Motor
- 3. Roll Axis Motor
- 4. Pitch Axis Motor
- 5. Visible-Light Camera (2 MP)
- 6. Infrared Camera
- 7. Laser Rangefinder

3. Technical Specifications

3.1 Microphone Array Hardware Parameters

Parameter	Specification
Microphone Channel	128
Array Aperture	460 mm
Arrangement Method	Multi-arm spiral
Microphone Frequency Range	20 Hz - 80 kHz
Sound Pressure Level Range	25 dBSPL - 128 dBSPL
Sample Mode	Continuous synchronous sampling
Sampling Rate	48 kHz
Sampling Bit Width	24 bit
Integrated Camera	1920x1080 / 1280x720 @ 25 Hz

Camera Field of View	63 degrees
Power Supply	USB / DC 12V
Communication Interface	USB (video + beam), UDP (raw data)

3.2 Acoustic Localization Parameters

Parameter	Specification
Maximum Beam Count	16
Horizontal Angulation Range	10 - 120 degrees (aspect ratio 16:9)
Output Method	XY Coordinates / Azimuth Angle / Pitch Angle
Positioning Accuracy	+/- 2%
Positioning Distance	0.1 - 5000 meters (depending on sound intensity) Fixed-wing: ≥ 5000 m Fiber-optic: ≥ 700 m Multi-rotor: ≥ 500 m (DJI Avata 2)
Beam Frame Rate	25 fps
Processing Platform	FPGA
Focus Mode	Supported

3.3 EO Gimbal Parameters

Parameter	Specification
Model	CGTX80E
Stabilization Accuracy	Gyro stabilization ≤ 0.1 deg (disturbance 3 deg @ 1 Hz)
Frame Configuration	3-axis
Mechanical Frame Range	Azimuth: -110 to +110 deg; Roll: -60 to +60 deg; Pitch: -140 to +95 deg
Frame Angle Measurement Threshold	2 mrad
Controllable Rotation Range	Azimuth: -90 to +90 deg; Pitch: -90 to +30 deg

3.4 Infrared Camera Parameters

Parameter	Specification
Detector Spectral Band	8-12 μm , long-wave infrared (LWIR)
Pixel Size	12 μm
Detector Resolution	640 x 512
Optical Focal Length	35 mm
Field of View (FOV)	12.5 deg (H) x 10.0 deg (V) (+/-5%)
IR Snapshot Resolution	640 x 512
IR Video Resolution	640 x 512 @ 50 fps
Self-Test Time	≤ 6 s
NETD	≤ 40 mK
Detection Range	Under 10 km visibility and RH $\leq 60\%$: a DJI-class drone (0.4 x 0.4 m) forms a 2x2 pixel image at 320 m and can be recognized against a sky background.

3.5 Visible-Light Camera Parameters (2 MP)

Parameter	Specification
Visible-Light Sensor	1/2.8" 2 MP CMOS
Pixel Size	2.8 μm
Lens Focal Length	25 mm
Field of View (FOV)	12.3 deg (H) x 6.9 deg (V) (+/-5%)
Snapshot Resolution	1920 x 1080
Video Resolution	1920 x 1080 @ 50 fps
Operating Spectral Band	0.4 μm - 0.7 μm
Self-Test Time	≤ 6 s
Detection Range	Under 10 km visibility and RH $\leq 60\%$: a DJI-class drone (0.4 x 0.4 m) forms an 8x8 pixel image at 430 m and can be recognized against a sky background.

3.6 Laser Rangefinder Parameters

Parameter	Specification
Safety Class	Class 1 Laser
Laser Wavelength	905 nm
Ranging Range	10 m - 2500 m
Ranging Accuracy	+/- 1 m
Measurement Frequency	<= 4 Hz

3.7 Target Tracking Parameters

Parameter	Specification
Functions	Autonomous target detection (drones, aerostat balloons); target recognition, lock-on and tracking prediction (prediction time ≥ 1 s); adjustable tracking box size for manual tracking of any target.
Tracking Frequency	≥ 50 Hz
Autonomous Target Detection Categories	Includes drones, aerostat balloons
Detection Probability	$\geq 90\%$
Maximum Tracking Angular Velocity	≥ 20 deg/s

3.8 System-Level Parameters

Parameter	Specification
Storage	≤ 512 GB Micro SD Card
Detection / Recognition Range	Daytime (visibility ≥ 8 km): adult target recognition range per factory test report
Power	DC 10.8 V - 26.4 V @ 3 A; steady-state power consumption ≤ 12 W
Output Interfaces	Video: Ethernet, HDMI; Control: UART TTL, Ethernet, SBUS
Target Geolocation	CEP 10 m
Operating Temperature	-40 deg C to +55 deg C

Storage Temperature	-45 deg C to +60 deg C
Rain Test	Operates normally under light rain conditions

4. Environmental & Physical Specifications

4.1 Operating and Storage Environment

Parameter	Microphone Array Module	EO Gimbal Module
Operating Temperature	-10 deg C to 60 deg C	-40 deg C to +55 deg C
Optimum Temperature	10 deg C to 45 deg C	N/A
Operating Humidity	<= 95%	N/A
Storage Temperature	-40 deg C to 70 deg C	-45 deg C to +60 deg C
Storage Humidity	<= 95%	N/A

4.2 Dimensions and Weight

Parameter	Microphone Array Module	EO Gimbal Module
Dimensions	460 x 460 x 20 mm (excluding connectors)	88.0 mm (L) x 93.0 mm (W) x 120.0 mm (H)
Weight	< 1 kg (PCBA)	3-axis gimbal assembly: 380 g +/- 5 g

5. Interfaces & Communication

5.1 Microphone Array Interfaces

Interface Type	Description
USB	Video output + beam data transmission
UDP	Raw acoustic data transmission
DC 12V	DC power input

5.2 EO Gimbal External Interfaces

The external interfaces include VIDEO (video), PWR&CTRL (power and control), USB (internal interface), SBUS (remote controller), and HDMI (video) interfaces, as well as an SD card slot.

5.3 VIDEO & SBUS Interface Pin Definition

Connector Type: Receptacle, 15-pin.

Pin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Signal	VDD	VDD	GN D	GN D	23 2- T	23 2- R	N C	N C	RX+	RX-	TX+	TX-	N C	N C	GN D
Description	DC 10.8- 26.4V @3A Power	DC 10.8- 26.4V @3A Power	Power GN D	Power GN D	R S- 23 2 TX	R S- 23 2 RX	N C	N C	Ether net RX+	Ether net RX-	Ether net TX+	Ether net TX-	N C	N C	Signal GN D

Note: For the PCB outline 3D model, please contact our sales representative.

5.4 IP Configuration and RTSP Stream Address

Parameter	Value
IP Address	192.168.144.18
Subnet Mask	255.255.255.0
Device IP	192.168.144.108
RTSP Stream Address	rtsp://192.168.144.108/live/0

6. Software Support

6.1 Microphone Array Software

Software Item	Supported Platform
Open Source Demo	Win10 / Win11 QT
SO Library / DLL Library	Linux / Windows

6.2 EO Gimbal Display & Control Software

Installation: Place the software archive on the computer desktop and extract it. Open the folder and locate the "RemoteControlPanel.exe" application file; double-click to launch.

No formal installation is required.

Operation: The "RemoteControlPanel" software supports Chinese/English interface switching (Ctrl+C for Chinese, Ctrl+E for English). This is a universal control software for the company full product lineup, with gimbal control, video display, and parameter configuration functions.

Serial Communication Protocol: Please refer to the separate "Serial Communication Protocol" document for details.

7. Installation & Operation

7.1 EO Gimbal Mounting Methods

The CGTX80E uses a centralized mounting design and is supplied with 2 sets of mounting hardware:

- Method 1 - Rear-top mounting interface: Mount using the mechanical interface on the rear-top of the pod. This method effectively reduces the overall height of the customer product. Split mounting (gimbal and servo controller separated) is supported.
- Method 2 - Top mounting interface: Mount using the mechanical interface on the top of the pod. This method reduces the depth-space requirement of the customer product.

7.2 Installation Procedure

- Step 1: At room temperature and standard atmospheric pressure, align the top of the payload with the mounting plate.
- Step 2: Secure the payload to the mounting plate using three M2 screws, paying attention to the mounting orientation.

7.3 Firmware Upgrade

The CGTX80E tactical-grade micro 3-axis EO stabilized gimbal firmware is pre-flashed at the factory before shipment. If a firmware upgrade is necessary, technical support is available for remote upgrade guidance.

8. Product Precautions

- After use, place the device in the CGTX80E series safety case and replace the desiccant promptly to prevent lens fogging caused by excessive ambient humidity. If the lens fogs up, the moisture will typically evaporate naturally.
- Do not place the camera in direct sunlight, in poorly ventilated areas, or near heat sources such as radiators or heaters.
- Do not frequently power the gimbal camera on and off. After shutdown, wait at least 30 seconds before restarting the device; otherwise, the service life of the camera core may be affected.
- The gimbal must be kept in a ceiling-mounted (suspended) orientation when powered on; otherwise, logical errors may occur.
- The gimbal power supply current limit must be set to at least 3.5 A or higher.
- Ensure that the gimbal connectors and surface are dry and free of water before assembling the gimbal.
- Before use, always confirm that the gimbal is securely mounted on the aircraft.
- Do not touch the camera lens surface coating directly with fingers or scratch it with hard objects, as this may cause blurry imaging and degrade image quality.
- When cleaning the camera lens, use a soft, dry cleaning cloth to wipe the lens surface. Do not use alkaline cleaning agents.

9. Packing List

The standard configuration includes the following items:

No.	Item Name	Quantity	Remarks
1	CGTX80E Tactical-Grade Micro 3-Axis EO/IR Gimbal Camera	1 unit	-
2	Product Certificate of Conformity	1 piece	-
3	Packaging Case	1 piece	-

When the product is in transit or storage, it should be placed inside the packaging case.

10. After-Sales Service & Warranty

We promise that if you encounter any problems or difficulties while using the product, you may contact us for a proper resolution.

10.1 Return-for-Repair Process

If the purchased product fails to operate normally, please contact the official after-sales support center for consultation. Product issues requiring return typically fall into two categories:

- Product malfunction / defect
- Human-induced damage

Products in either category may be returned for repair. Product malfunctions within the warranty period are repaired free of charge. Out-of-warranty malfunctions and human-induced damage will incur a corresponding repair fee.

10.2 7-Day Return Policy

Return conditions:

- Within 7 calendar days of receipt, the product has no manufacturing defects, and the outer packaging, accessories, gifts, and manuals are complete with no human-induced damage, and the product has not been used.
- Within 7 calendar days of receipt, a non-human-induced performance fault is discovered.

Returns may be refused under the following circumstances:

- Return request submitted more than 7 calendar days after receipt.
- Incomplete packing list - missing outer packaging, accessories, gifts, or manuals; product or packaging appearance damaged by human causes.
- Unable to provide valid proof of purchase, or the proof appears forged or altered.
- Damage determined not to be caused by product quality issues; unauthorized modification, incorrect installation, or use not in accordance with the manual; foreign object ingress (water, oil, sand, etc.).
- Torn or altered labels, machine serial numbers, waterproof marks, or anti-counterfeiting marks.
- Damage caused by force majeure such as fire, flood, lightning strike, or traffic accident.
- After confirming return service with us, the defective product is not shipped within 7 calendar days.

10.3 15-Day Free Replacement Policy

Replacement conditions:

- Within 15 calendar days of receipt, damage sustained during shipping is discovered and a damage certificate from the shipping company can be provided.
- Within 15 calendar days of receipt, the product is found to be significantly inconsistent with the original product description in one or more important aspects.
- Within 15 calendar days of receipt, a non-human-induced performance fault is discovered.

Replacements may be refused under the following circumstances:

- Replacement request submitted more than 15 calendar days after receipt.
- Unable to provide valid proof of purchase, or the proof appears forged or altered; incomplete replacement item or appearance damaged by human causes.
- After technical support inspection, no quality issue is found in the product itself.
- Damage determined not to be caused by product quality issues; unauthorized modification, incorrect installation, or use not in accordance with the manual; foreign object ingress.
- Torn or altered labels, serial numbers, waterproof marks, or anti-counterfeiting marks.
- Damage caused by force majeure such as fire, flood, lightning strike, or traffic accident.
- After confirming replacement service, the defective product is not shipped within 15 calendar days.
- Shipping damage without a damage certificate issued by the shipping company.
- Other circumstances not listed under the "Three Guarantees" regulations.

10.4 One-Year Free Warranty

Warranty conditions:

- Within the specified warranty period, the product is used normally and develops a non-human-induced performance fault.
- The product has not been subject to unauthorized disassembly, modification, or addition.
- Valid proof of purchase is provided.

The following circumstances are NOT covered by the free warranty:

- Collision or damage caused by human factors.
- Damage caused by unauthorized modification, disassembly, or opening of the enclosure.

- Damage caused by unauthorized incorrect installation, use, or operation.
- Damage caused by the customer repairing or assembling the product on their own without guidance.
- Damage caused by unauthorized circuit modification or improper use.
- Damage caused by forced use when components are aged or damaged.
- Reliability or compatibility issues arising from use with non-officially certified third-party components.
- Torn or altered machine serial numbers, factory labels, or other markings.
- After confirming warranty service, the defective product is not shipped within 7 calendar days.

11. Disclaimer

Before using this product, please ensure that you have read and fully understood the user instructions and this disclaimer, and strictly follow the product manual for installation and operation. Failure to operate in accordance with the manual may result in product damage, personal injury, or property loss. The company reserves the right to improve product specifications, design, and packaging without prior notice. Technical parameters in this document are for reference only; actual performance is subject to product measurement.