

ADVANTECH

*& WISE-Edge
Edge Computing in Action*

AIR-021 Sales Kit

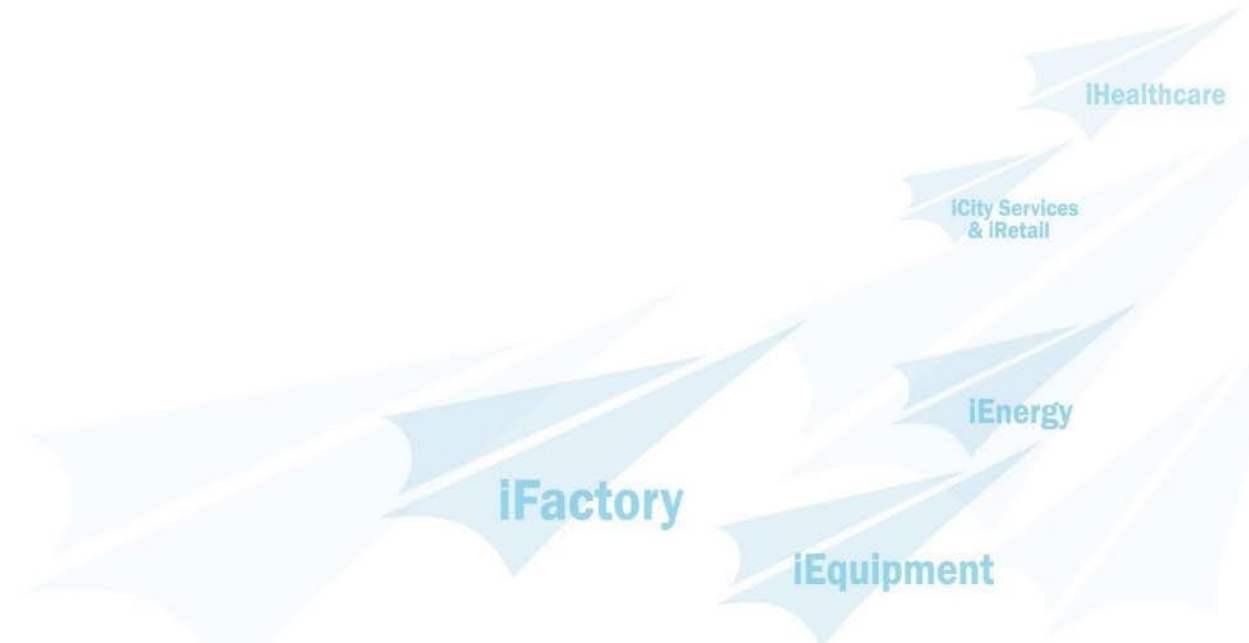
Jetson Orin-Ready Platform



Bruce Wang

IIoT | ECG | Edge AI Platform

2025/12/22



First Advantech MIPI-C Edge AI System: AIR-021

AIR-021 Core feature



Ultra-Low Latency

Direct-to-SoC connection eliminates encoding/decoding latency and reduces CPU load.



Cost Competitive

73% cost saving compared with GMSL alternatives



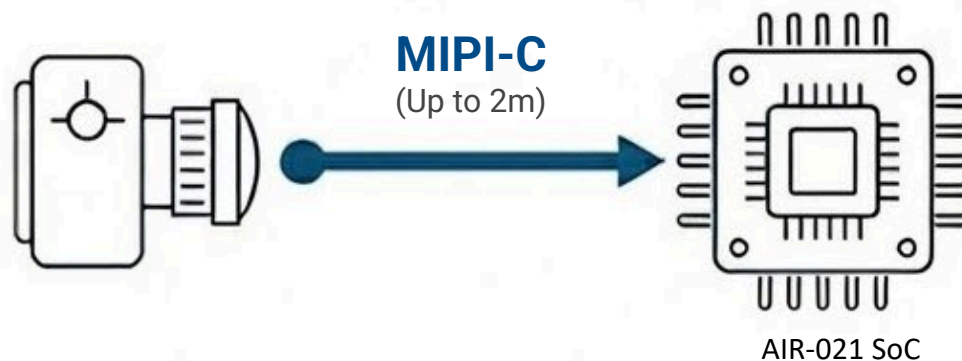
FIRST WITH MIPI-C CAMERA CONNECTIVITY

Ultra-low latency, flexible range (up to 2m), and cost-effective camera setup.



Flexible Range

Supports industrial cables up to 2m, perfectly filling the gap between FFC (<30cm) and USB3 (<3m).



Advantech MIPI-C Breaks Interface Boundaries



Easy Integration

Supports GMSL/FPD-LINK board integration without requiring a system redesign.



Target Markets

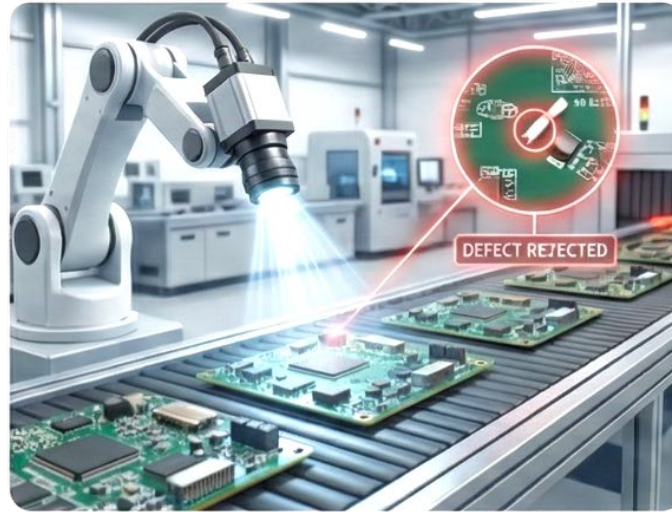
Unlocking New Possibilities: AIR-021 w/ MIPI-C in Three Key Application



Autonomous Mobile Robots (AMR)

Features :

- **Low-Latency 3D Vision**
connects directly to depth cameras for real-time perception and avoidance, eliminating USB latency.
- **Control Integration:**
Built-in CANBus communicates directly with AMR motor controllers, integrating AI vision and chassis control.



Automated Optical Inspection (AOI)

Features :

- **High Resolution & High Frame Rate:**
Supports 4-Lane MIPI for 4K/8MP cameras, capturing tiny defects with high resolution and frame rate.
- **Ultra-low latency**
Native MIPI's ultra-low latency ensures millisecond-level synchronization for image acquisition and production line signals.



Human Detection and Recognition (Smart poles)

Features :

- **Active Urban Sensing & Visual Analytics**
Smart poles serve as strategic hubs for integrating high-definition cameras, transforming passive infrastructure into active urban sensing nodes.
- **Real-time analysis and immediate alerts**
enables real-time visual data collection for critical applications such as traffic management, public safety, and crowd analytics.

Design Characters

Compact Dimension W 138 mm x H 55 mm x D 109.6 mm

Unified AIR 0 Series Identity
Reduces tooling costs and unifies brand aesthetics

Rugged Industrial Reliability
Supports wide range: -20°C to 50°C and 12-24V input

Scalable Storage & M.2 option

2x M.2 M key 2280 & 2242
E key/B key for WIFI/BT/5G



Streamlined Thermal & ME Design

Hidden screws design with shared high-performance fan

15+ Rich I/O for vertical

2x LAN, 4x USB, 2x USB2.0,
4x COM, 1xDIO, 1x CANBus

Pioneering MIPI-C Camera Support

Supports dual MIPI-C and up to 8x GMSL cameras.

AIR-021 Specifications

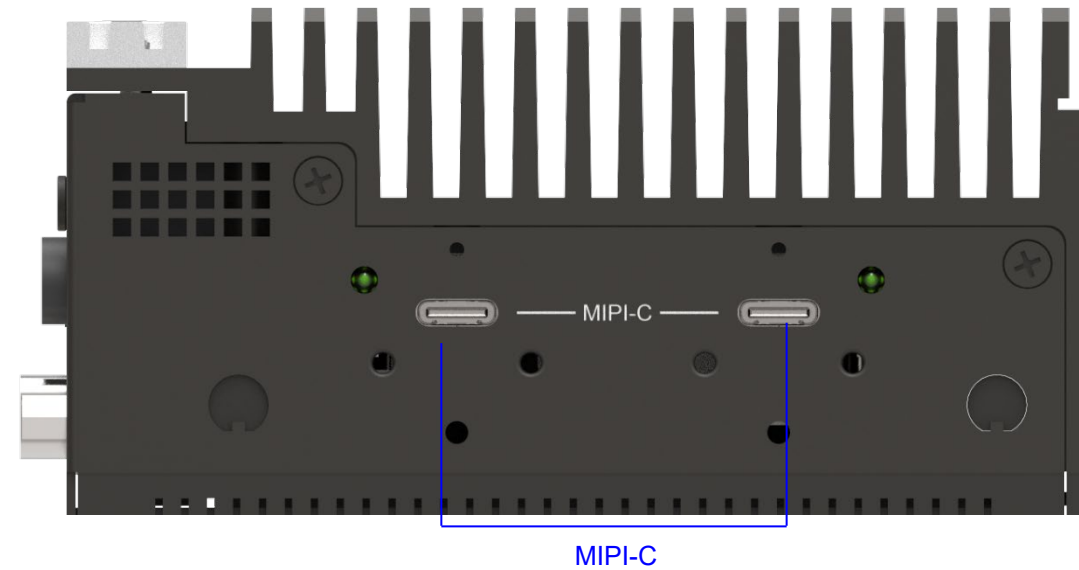
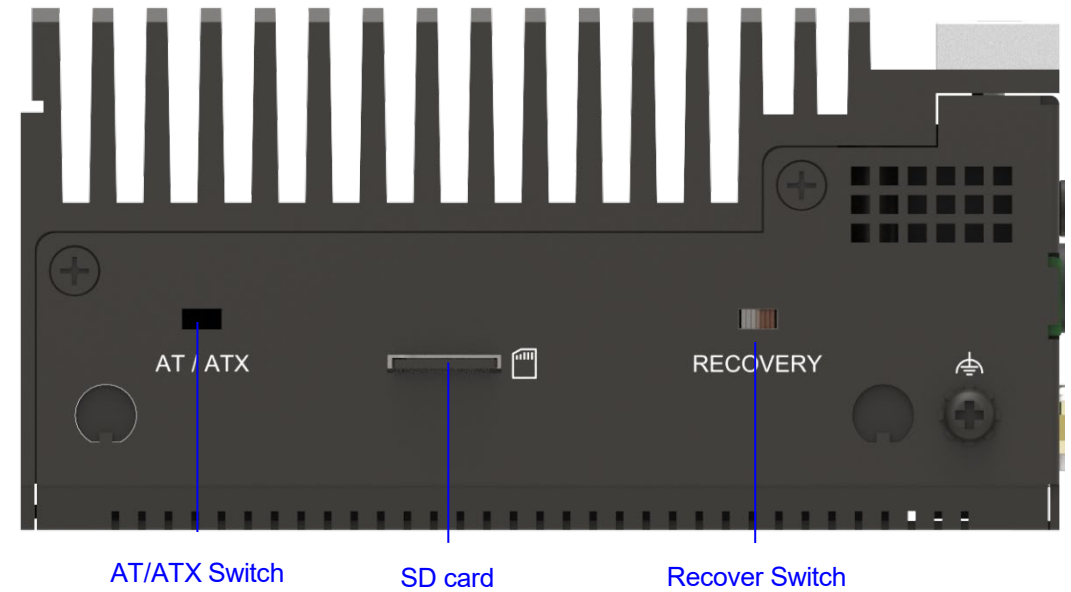
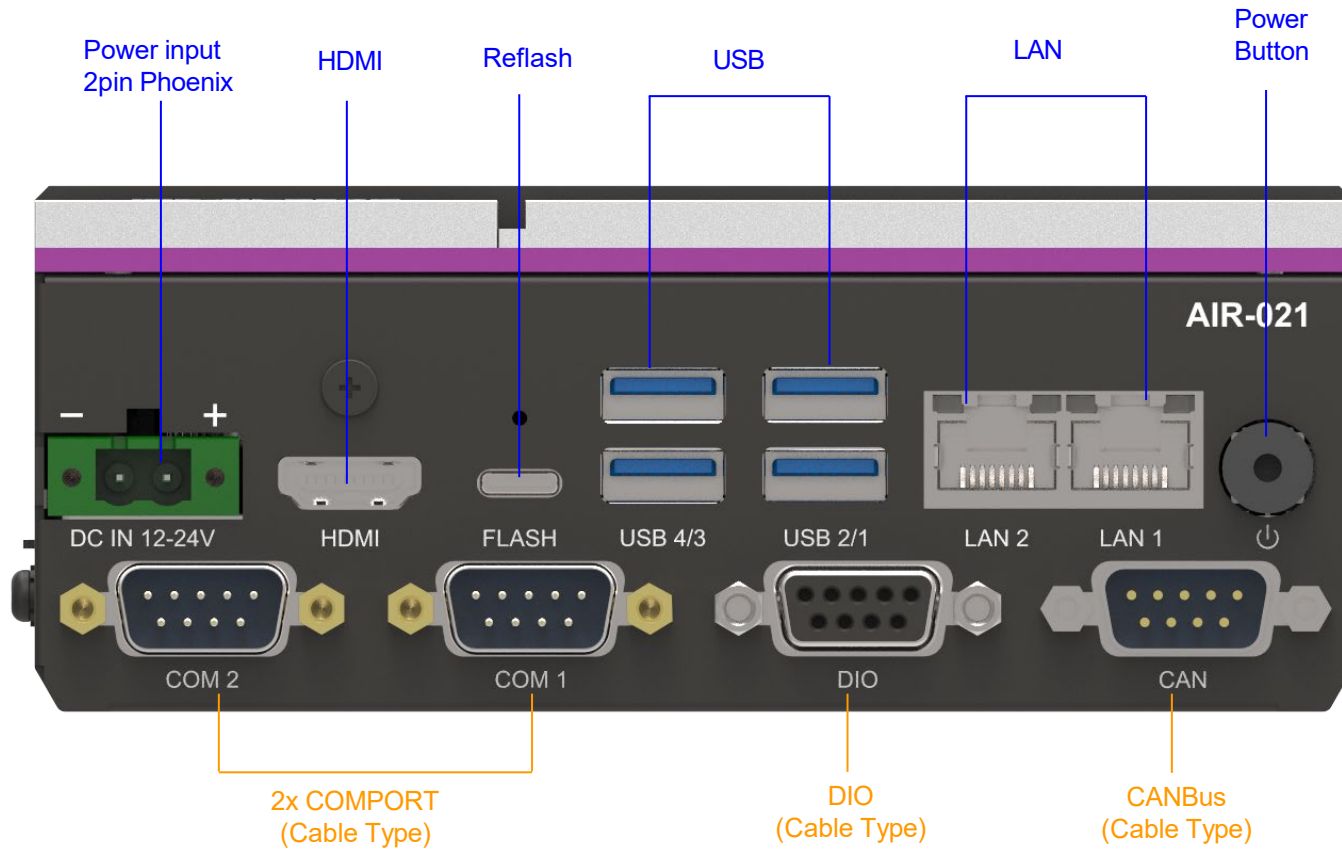


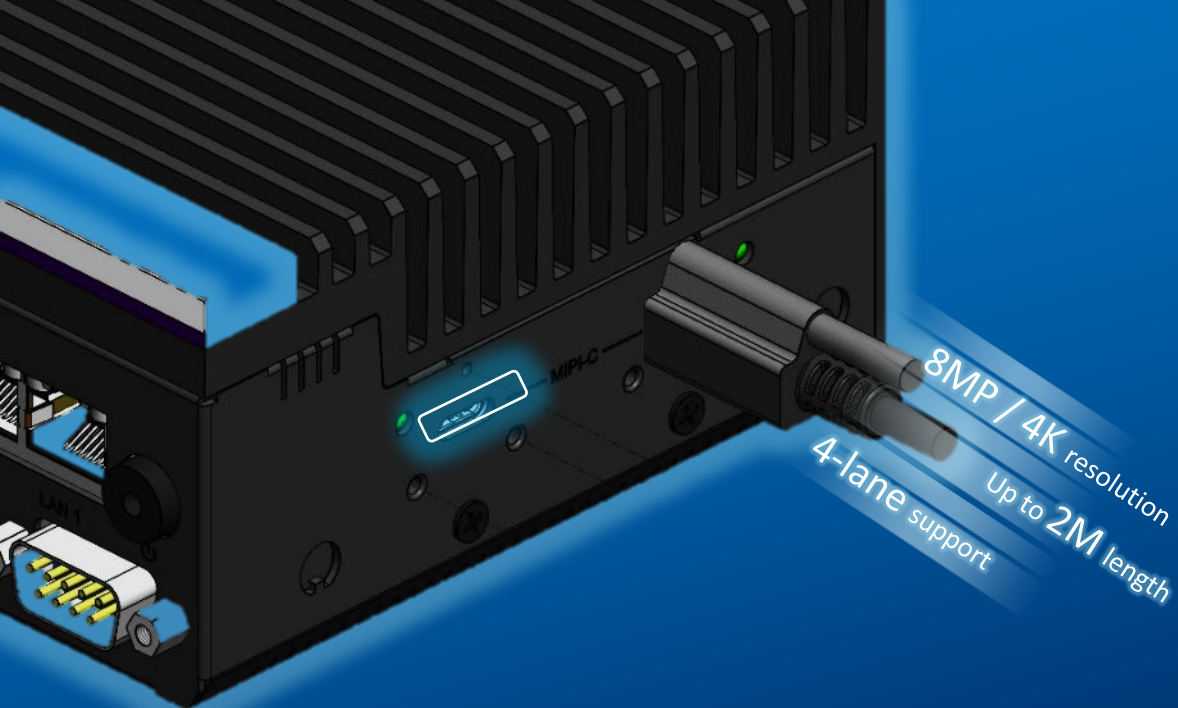
AIR-021 Dimension: 138 x 109.6 x 55 (mm)

Model	AIR-021 Series		
SKU	AIR-021O-S0A1U	AIR-021O-B0A1U	AIR-021R-S7A1U
SoC	Orin NX 16GB	Orin NX 8GB	Orin NANO 8GB
TDP	40W (MAXN_SUPER)	20W (MAXN_SUPER)	25W (MAXN_SUPER)
Display	1, HDMI 2.0b up to 3840x2160 60MHZ		
I/O	4x USB 3.2 type A(Gen2 x2/Gen1 x2), 1x USB type C(only for USB Recovery), 2x GbE(2.5G x1/ 1G x1), 4x RS-232/485(DB9 x2/Internal wafer x2), 1x 16 bit DIO, 1x CANBus, 2x MIPI over Type C		
Storage	1x M.2 M key 2280 & 2242		
Expansions	1x M.2 B key 3052 (USB3.2 Gen1) for 5G module 1x M.2 E key 2230 (PCIe x1/USB2.0) for Wi-Fi/BT module 1x M.2 M Key 2280 (PCIe x4, for NVMe) 1x M.2 M Key 2242 (PCIe x1, for NVMe)		
Power Input	12-24V DC-IN		
Operating Temp.	-20~50C w/o airflow (Fan)	-20~50C w/ 0.7 m/s airflow (Fanless)	
Dimensions	138 × 109.6 × 55mm		
Operating System	Linux Ubuntu (JetPack 6.2 above)		

AIR-021 System Placement

Front IO:





Advantech MIPI-C (MIPI CSI over Type C)



Ultra-Low Latency

Direct CPU CSI-2 connection eliminates conversion delays, reducing latency and power consumption



Cost Competitive

73% cost saving
compared with GMSL alternatives



Flexible Range

Optimal for short-to-mid range with cable options:
0.5/1/1.5/2m, bridging FFC ($\leq 30\text{cm}$) and USB3 ($\leq 3\text{m}$) gap.

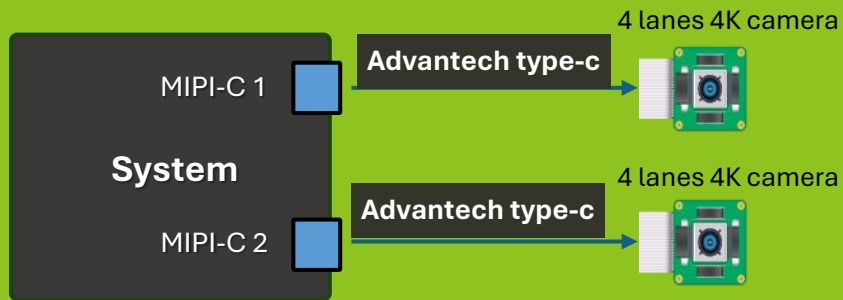


Easy Integration

Supports GMSL/FPD-LINK board integration without requiring system redesign, streamlining implementation.

Advantech MIPI-C Solutions

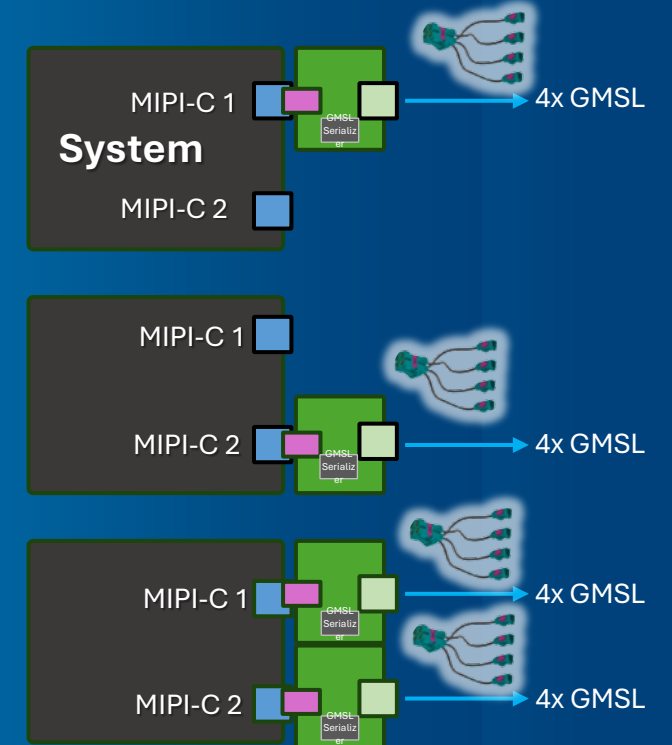
MIPI Camera



Vendor	Model	Interface	Sensor Vendor	Sensor	Resolution max	Frame rate max
Appro.pho	IMX335+ ISPi(YUV)	MIPI-C	SONY	IMX335	5M(2560x1920)	30fps
Appro.pho	AR0234+ ISPi(YUV)	MIPI-C	ONSEMI	AR0234	2.3M(1920x1200)	60fps
Appro.pho	AR0822(4K) + ISPi(YUV)	MIPI-C	ONSEMI	AR0822	4K(3840x2160)	30fps(4lane)
Orbbec	G335L MoC	MIPI-C		Stereo Vision / RGB	Depth: 1M(1280x800)	30fps
					RGB: 1M(848x480)	60fps

MIPI-C Solutions

AMO-0211 GMSL Dongle for GMSL Camera



Edge AI
SDK

AIR-021

Accelerate Vision AI with Jetson Orin-Ready Platform



Phase in 2026 / Feb

Longevity 2032 / Feb

Features

Optimized for AI Vision Application:

1. Powered by NVIDIA® Jetson™ Orin NX / Orin Nano modules, delivering up to 157 TOPS AI performance
2. Supports JetPack™ 6.2 SDK for seamless AI model deployment and vision processing
3. Ideal for AMR, industrial automation, and smart surveillance



Powered by NVIDIA Jetson Orin NX/Nano modules for scalable processing.

High Performance & Flexible Configuration

1. Utilizes NVIDIA Jetson Orin Nano/NX for scalable AI performance
2. Flexible TDP configuration to meet varying performance and power requirements.
3. Offers fanbased (NX 16G) and Fanless(NX 8G/NANO 8G) cooling options, suitable for diverse industrial environments

Application



AOI Inspection



Patrol Robot

AI Box for Detection and Inspection

Unique & Innovative Camera Connectivity

1. Supports MIPI CSI, USB3, and expandable to GMSL2 cameras
2. Features MIPI over USB-C (up to 2m) for simplified camera setup.
3. Supports up to 4x GMSL2 cameras via expansion, enabling versatile vision applications
4. Flexible I/O for real-time, multi-camera vision systems

Rich & Diverse Industrial I/O

1. Provides extensive industrial I/O: dual RS232/422/485, dual Ethernet (2.5G + 1G), 1x DIO, 1x CAN
2. Supports optional wireless connectivity: 5G and Wi-Fi/Bluetooth





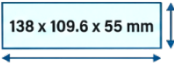

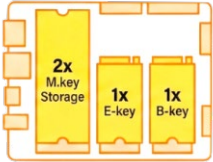

Integrated Edge AI & Advanced Vision AI Capabilities

1. Integrates Advantech Edge AI SDK(Inference kit) for streamlined AI development
2. Uniquely supports many AI model(Yolo) at the Vision AI
3. Enables deeper, more adaptive edge intelligence for advanced AI applications

AIR-021: The Perfect Fit in Advantech Family

Point 1: Unleashing High-Density Computing at the Edge **Orin NX-level** performance

Point 2: combined with **streamlined camera cabling** in **limited spaces** (e.g., AMRs)

	AIR-020R 	AIR-021 (New Project) 	EPC-R7300 
Product Positioning	Entry Ultra-Compact AI System	High-Performance Compact AI System	Flexible Barebone System
AI Performance Reference	Up to 67 TOPS (Supports Orin Nano Only)	Up to 175 TOPS (Supports Orin NX / Nano)	Up to 175 TOPS
Camera/Visual Interface	Only USB / GigE (Short-distance / External USB)	MIPI over Type-C (Long-distance, Data + Power) 	Only USB / GigE (Requires more space/cabling)
Dimensions (W x D x H) 	138 x 110 x 56.6 mm (Similar footprint, lower perf.)	138 x 109.6 x 55 mm (Optimized Compact Design) 	173 x 152 x 55 mm (Larger footprint, wider)
I/O Expansion 	Basic Integration (2x GbE, 2x USB, 1x M.key Storage, MiniPCIe)	Rich Integration (2x GbE, 4x USB, 2x M-key Storage , 1x E-key, 1x B-key) 	High Flexibility (UIO)
Application	Basic AOI, People Counting	AMR, Advanced AOI, VLM Space-constrained , high-performance needs	Gateways, Industrial Control Space-permissive, custom I/O needs




AIR-021 Camera Expansions

APPRO.PHOTO

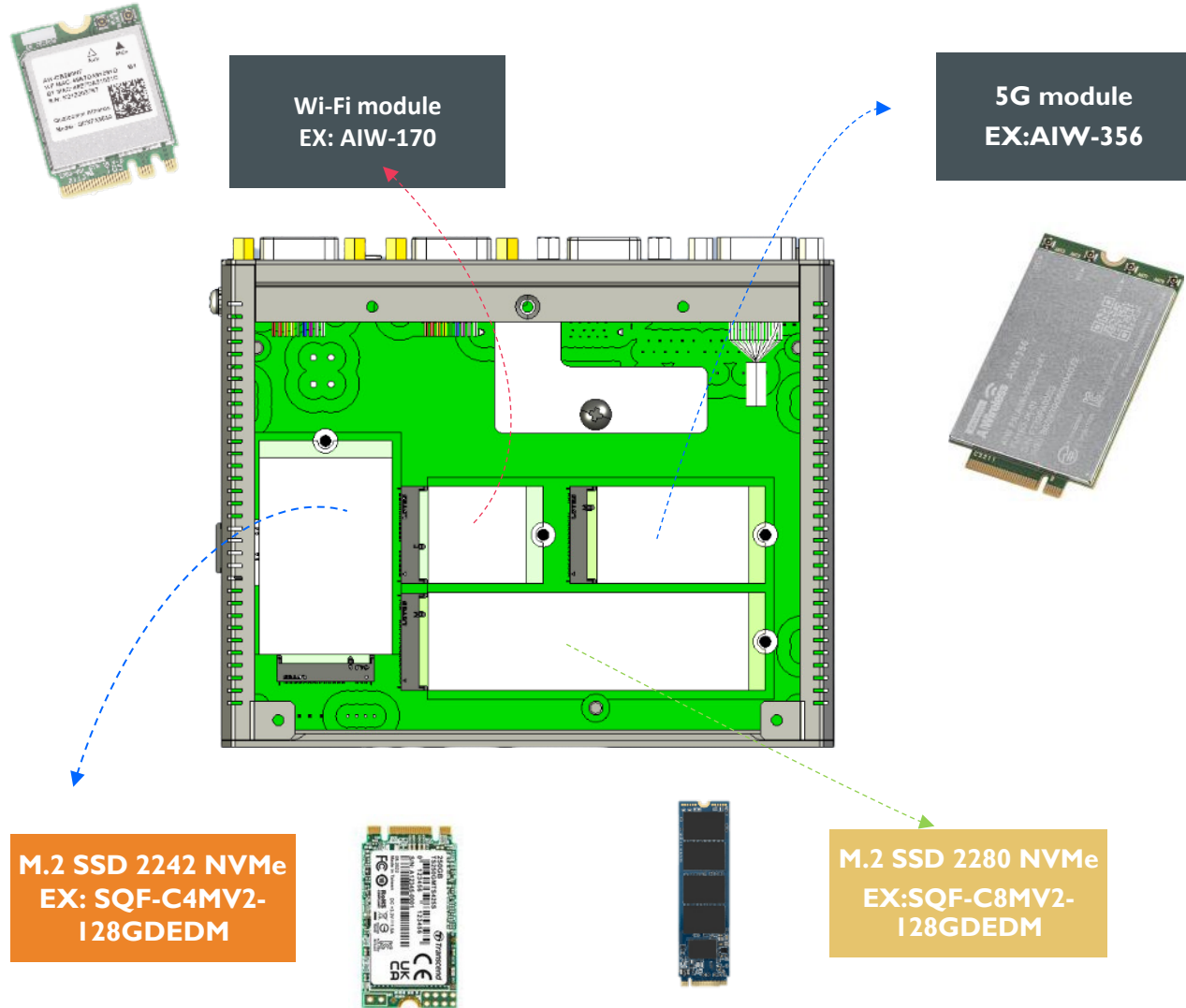


1. Resolution/Frame Rate : 2M~4K, 30fps~60fps
2. Camera Vendor: Appro/Orbbec
3. Sensor Vendor: Sony/Onsemi

Camera for AIR-021	USB Camera	GigE Camera	MIPI-C camera	GMSL Camera
Interface	USB3.2 Gen1 USB3.2 Gen2	2.5G/RJ45 1G/RJ45	USB-C with MIPI function	USB-C with AMO-0211
Part Number	2D: CAM-2210-U 3D: CAM-5530-U, CAM-5330-U	TBD	2D: CAM-2310-C, CAM-2210-C, CAM-2220-C, CAM-2110-C, CAM-2320-C	2D: CAM-2310-G, CAM-2210-G, CAM-2220-G, CAM-2110-G, CAM-2320-G 3D: CAM-5530-G
Image				

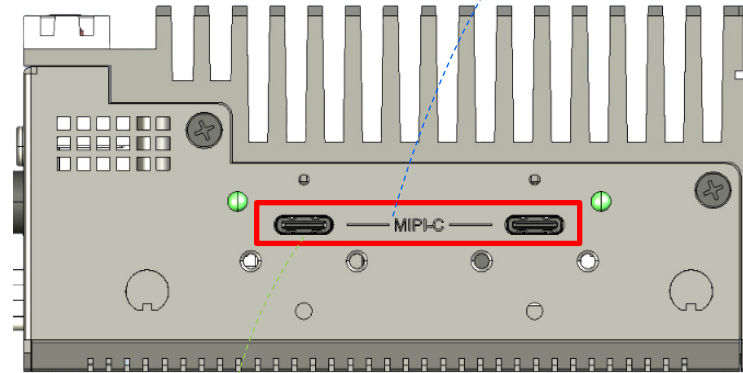
Expansions for MIPI-C camera, storage and M.2 module

Storage and M.2 module Installation

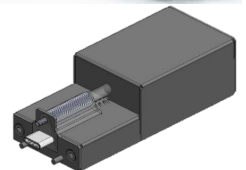


MIPI-C & GMSL camera

- MIPI-C
 1. MIPI-C camera
 2. MIPI-C cable



- GMSL
 1. GMSL camera
 2. mini fakra cable (1 to 4)
 3. AMO-0211



Edge AI SDK | Inference Kit

Seamlessly Jump into Edge AI Development



AIR-021

Integrates
Edge AI SDK



Object Detection



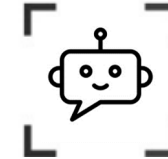
Facial Detection



Person Detection



Pose Estimation



LLM Chatbot

Runtime SDK

Compatible ubuntu & drivers

Essential & compatible SDKs

One installer for drivers & SDKs



< 10 mins
Install & Run

Benchmark Tool

No-code GUI utility

Validated AI models

Real-time workload monitoring

Autonomous Mobile Robot(AMR) in Factory

This use case focuses on deploying Autonomous Mobile Robots (AMRs) in a factory environment. The primary goals are to reduce manual labor and costs, and improve safety across power plants and substations. This is achieved through advanced video analysis and intelligent inspection solutions.



Challenges

- High Manual Labor Costs
- Safety Risks
- Inefficient Throughput

Solutions

- **Edge AI Box Integration:** The system uses the Edge AI Box (AIR-021) for on-device inference, handling tasks like navigation, obstacle avoidance, and item recognition.
- **Real-time Navigation System:** The AMRs are equipped with MIPI-C cameras and 5G connectivity to ensure real-time navigation and collision avoidance in the dynamic factory environment

Benefits

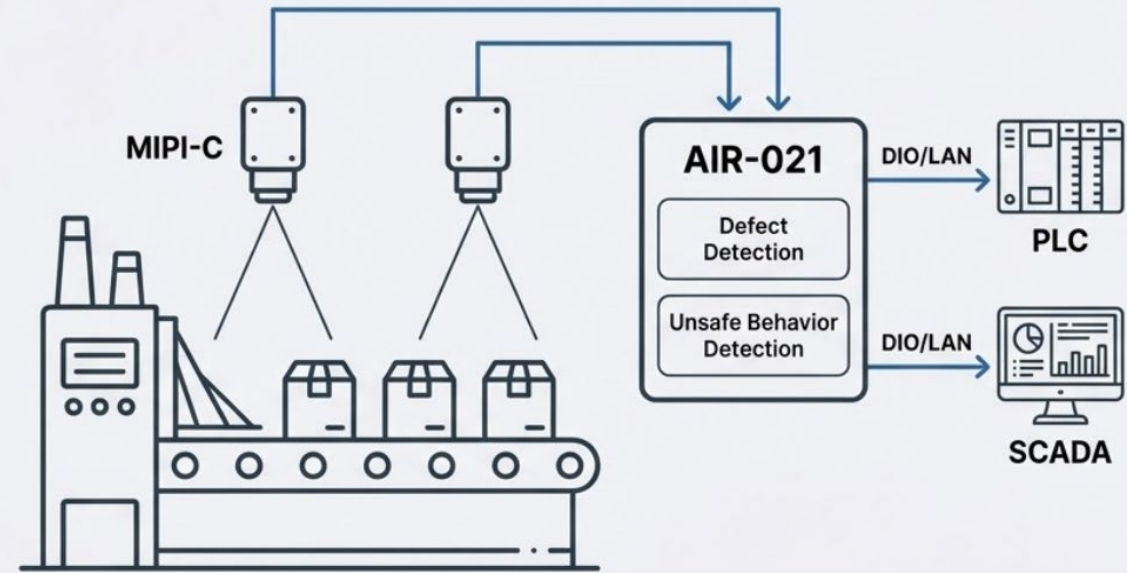
- Enhanced Safety and Reduced Costs
- Optimized Logistics and Throughput
- Scalable and Flexible Manufacturing



Use Case

Smart Quality and Safety Monitoring in food factory

The AIR-021 is a high-performance industrial edge AI platform. The system uses MIPI-C cameras to capture real-time visual data on the production line. It seamlessly integrates with existing Programmable Logic Controllers (PLC) and SCADA systems for immediate action and centralized data visualization.



Challenges

- Manual Inspection Limitations
- Reactive Safety Protocols
- Data Silos and Slow Response

Solutions

- **Real-Time Defect Detection:** The AIR-021 uses advanced machine vision algorithms to instantly identify product defects (e.g., mislabeling, damaged packaging) on the conveyor belt, ensuring only quality items proceed
- **Seamless Industrial Protocol Integration:** Utilizing DIO and LAN interfaces, the AIR-021 directly communicates with the PLC for instantaneous line control (e.g., stopping the line, diverting a defective product) and provides rich data to the SCADA system for performance tracking

Benefits

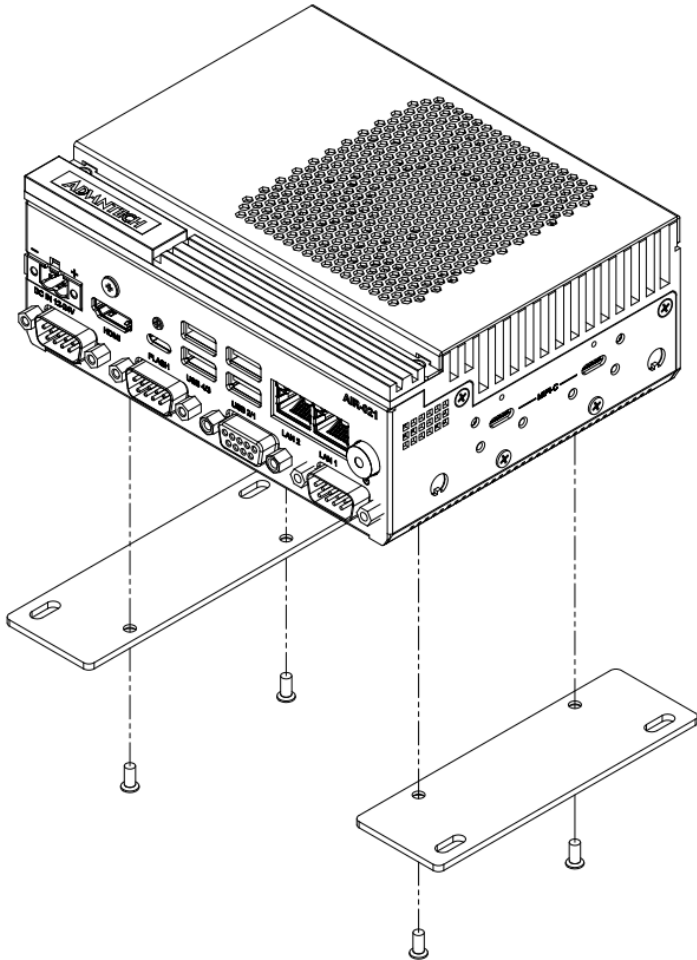
- Enhanced Quality and Reduced Waste
- Improved Worker Safety and Compliance
- Optimized Operational Efficiency



AIR-021 Key peripherals

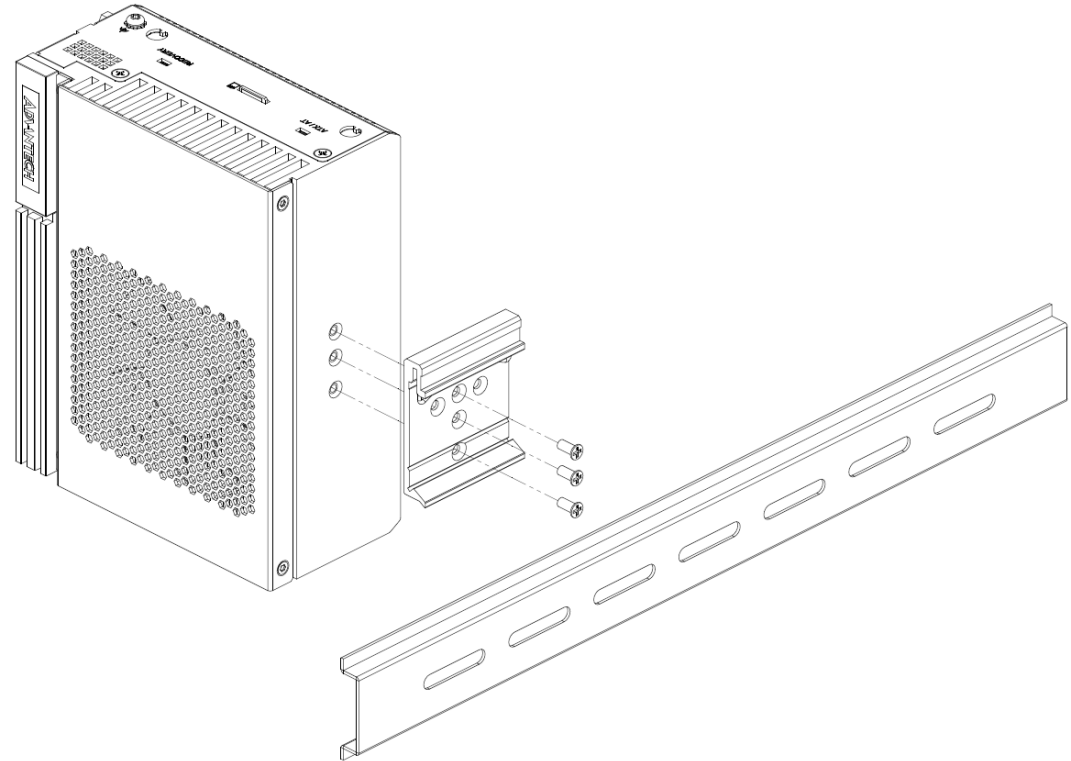
Wall-Mount Kit

Put in accessory box by default
1960086357N041



Din rail kit

Optional item in Datasheet
1960015198T011



AIR-021 Ordering Information

Standard SKU

Part No.	NVIDIA Module	NVIDIA Module Memory	NVIDIA Module eMMC	Storage	HDMI	GbE	USB	CANBus	RS-232/422/485	GPIO	Power input	Operating Temperature
AIR-021O-S0A1U	Orin NX	16GB LPDDR5	N/A	M.2 M.Key 2242/2280 (default only built-in 128GB in M.2 2280)	1	2	4	1	2	1	12-24V DC	-20~50 °C
AIR-021O-B0A1U	Orin NX	8GB LPDDR5										
AIR-021R-S7A1U	Orin NANO											

Packing List

Part Number	Description
-	AIR-021 Unit
-	User Manual for AIR-021
1652000099	Phoenix connector counterpart
1960086357N041	Desk mounting kit
1700028866-01	Micro USB cable 40cm for system recovery

Optional Items

Part Number	Description
1702002600	Power Cord UL 3P 10A 125V 183cm, USA type
1702002605	Power Cord EU 3P 10A 250V 183cm, EU type
1702031801-11	Power Cord BSI 3P 10A 250V 183cm, UK type
1700000237	Power Cord PSE 3P 12A 125V 183cm, PSE special connector

OS Support List (Optional)

P/N	Description
TBD	Win 11 LTSC AIR-021
TBD	Ubuntu 24.04

ADVANTECH

Enabling an Intelligent Planet

& WISE-Edge
Edge Computing in Action

Thank you