802.11ag/agn/ac AP/STA, PTP Mesh, PTMP Mesh Continuous Hops Loop Redundancy System and Hi-mobile (Support UAV Flight Control Link) System

WiFi MIMO Long Range / High Bandwidth / Multi Unique Features/ Dual Mode, Dual Band, Dual Redundancy

WiFi 5 Equivalent to Military Grade Outdoor Wireless Base Station

■ External antenna style (IP69)

Flat panel cover

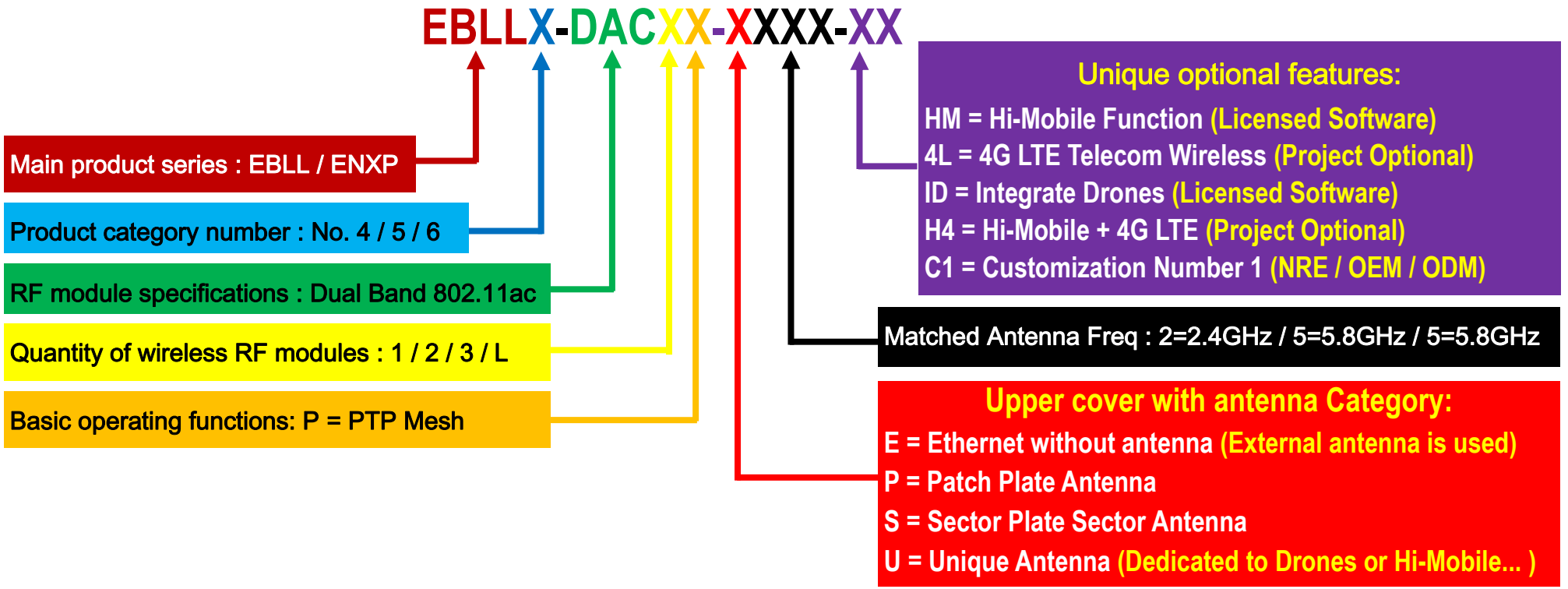
■ 1 External antenna

■ 2 External antenna

■ 3 External antenna

■ All-in-one antenna style (IP69)

IO-Power Outdoor Wireless Device Model Analysis



■ Outdoor wireless product function description

The IOP-EBLL4-DACXP XXXX-XX outdoor wireless product utilizes 802.11ag/agn/ac 2X2 MIMO technology. Through specialized and unique software development, it offers a variety of wireless transmission capabilities, specialized market-specific industrial applications, unique anti-interference capabilities, multi-layered security encryption protection, multi-path redundancy and repair, routing and DHCP capabilities, PTP Mesh backbone transmission, PTMP Mesh point-to-multipoint, Hi-mobile high-speed mobility, and 4G-LTE (optional) :

1. WiFi AP (Connection Server) / STA (Connection Client): Features standard WiFi AP functionality and is compatible with standard STA client connections.

2. PTP Mesh Point-to-Point Loop back up: Provides point-to-point multi-loop backup and connection recovery capabilities, with relay transmission, unique interference-resistant connection frequencies, and a proprietary military-grade encryption mode. This functionality is similar to the previous generation EL-N-X outdoor wireless product.

3. PTMP Mesh Point-to-Multipoint Mesh: This point-to-multipoint aggregation transmission mode operates similarly to AP-to-STA, but with a unique software design that offers military-grade, interference-resistant, multi-layered security encryption, and support for hen-leading-chicken operations. It is ideal for drones operating in group settings, with a leader and wingman.

4. Hi-Mobile: The unique design supports high-speed mobile wireless transmission at speeds exceeding 200 km/h, with a mobile transmission bandwidth of up to 100 Mbps and a handover speed of less than 50 ms. It is suitable for railway systems, MRT systems, highway systems, general road systems, science and technology industrial parks, large-scale factory security patrols, golf courses, special environments, and specialized applications.

Leveraging the high-altitude flight characteristics of drones, high-speed mobile wireless signal coverage can be shifted

from ground-based horizontal coverage to high-altitude drone wireless signal corridor coverage. Combined with Hops platform extension technology, vertically overlapping wireless signal zones achieve high-altitude coverage with multiple wireless corridors. This extends the wireless connection transmission distance and height of multiple drones, while also providing greater bandwidth and faster, smoother handovers, further enhancing the diverse application benefits and value of drones.

5. **4G-LTE wireless transmission function (Optional):** Specially designed 4G-LTE wireless transmission function, inserting a 4G-LTE SIM card, acts as a 4G telecom external network connection outlet.

The IOP-EBLL4-DACXP EXXX-XX wireless product features a built-in 2.4GHz wireless module and a built-in 5.8GHz wireless module, forming a basic dual-band wireless dual-module product. For applications requiring more transmission, more bandwidth, and more specialized functional architectures, the wireless PCBA motherboard also retains an expandable 5.8GHz module interface. Through core software copyright loading or authorized updates, customers can use this wireless product device with more functional upgrades and expanded architectural flexibility to meet specific market needs, providing customers with a unique wireless product market competitive advantage that far exceeds competitors.

- The first 2.4GHz 802.11gn wireless module uses HT40MHz channel width transmission, achieving a maximum transmission rate of 300Mbps, and AP/STA or PTP Mesh transmission bandwidth of over 180Mbps. Or the first 5.8GHz 802.11ac wireless module uses HT80MHz channel width transmission, achieving a maximum transmission rate of 867Mbps, and AP/STA or PTP Mesh transmission bandwidth of over 450Mbps.
- The second 5.8GHz 802.11ac wireless module uses HT80MHz channel width transmission, achieving a maximum transmission rate of 867Mbps, and AP/STA or PTP Mesh transmission bandwidth of over 450Mbps.
- The third external expansion 5.8GHz 802.11ac wireless module uses HT80MHz channel width transmission, achieving a maximum transmission rate of 867Mbps, and AP/STA or PTP Mesh transmission bandwidth of over 450Mbps.

■ EBLL4 – Product function description of software version

The IOP-EBLL4-DACXP EXXX-XX outdoor wireless product features four basic operating modes: a standard WiFi AP (Access Point) connection server, a dedicated STA (Station) connection client, PTP Mesh point-to-point backbone transmission, and PTMP Mesh point-to-multipoint wireless transmission.

It also offers a dedicated customer-specific option for Hi-Mobile high-speed mobile wireless transmission, suitable for applications such as high-speed vehicles, robots, remote-controlled vehicles, unmanned ships/vessels at sea, and high-altitude drone flight control. The following describes the following:

1. WiFi AP server operation mode :

This device provides Wi-Fi users with Internet access and basic wireless transmission applications, including point-to-point (PtP) and point-to-multipoint (PtMP). These functions conform to the international standard for Wi-Fi access points (APs).

It also features Router and DHCP (Support Non-Router and Router Mode): simplified DHCP IP assignment and router isolation for internal and external networks, enabling more diverse network architecture applications and enhanced performance.

2. STA (Station) client operation mode :

A. This device is a dedicated WiFi AP for client use and cannot be connected to other AP devices.

B. STA clients connect to a dedicated AP server wireless device and implement a multi-point continuous relay hop transmission mechanism, providing low bandwidth loss and low packet response latency. This allows for the

establishment of multiple wireless transmission backbones over a large area, achieving specialized wireless network transmission system applications.

>>Estimation of wireless Hops station operation parameters for STA←→AP:

■ Each repeater hop adds 1ms of latency. After three repeaters, the delay increases by an additional 2ms, and the total latency accumulates in this way.

■ Each repeater hop reduces the wireless transmission bandwidth by 10-20Mbps. After 10 repeaters, the wireless bandwidth remains above 300Mbps (HT80MHz).

■ The wireless transmission range for each repeater hop is independently planned and estimated, similar to the typical point-to-point wireless transmission range. However, it is recommended to keep it within 3km or maintain a signal strength within -60dBm (for example, to achieve a transmission rate of 867Mbps on HT80MHz, a signal strength of around -40dBm is required).

C. When configured in STA client mode, you can use the advanced settings for the “Secondary AP mechanism”. You can pre-set multiple backup AP SSIDs on the operation webpage and implement a backup recovery connection attempt mechanism through "Auto-detect disconnection time," "RSSI signal drop threshold," and "Preset AP SSID priority."

3. EBLL4- PTP Mesh point-to-point backbone transmission operation mode :

Equipped with PTP Mesh operation capabilities; PTP Mesh provides "private military-grade, point-to-point anti-interference, secure encrypted transmission technology," and can deliver a point-to-point backbone transmission bandwidth of over 450Mbps, easily supporting the bandwidth transmission needs of more than 30 3MP IP cameras.

※ PTP Mesh key features include:

A. Multi-point wireless Hops platform backbone circuit redundancy transmission:

- After 15 relay hops, it can still maintain approximately 70% of wireless bandwidth traffic transmission and maintain latency within 90ms.
- Supports multi-point relay hop redundancy and recovery mode in PTP MESH Loops mode. In the loop architecture, if a transmission link is disconnected, the system automatically repairs the broken link.

B. Using private military-grade wireless transmission security encryption technology

- Private security encryption mode at the underlying software layer provides military-grade security and encryption protection.
- Private security encryption mode at the wireless transmission layer is also optional and supports standard WiFi security encryption mode.
- Military-grade wireless interconnection handshake communication mode completely isolates devices from standard WiFi connections.

C. Adopts a secure connection mode architecture similar to Mesh with group connection ID segmentation and has a private anti-intrusion mechanism

- Through the Mesh connection group method, the same wireless group can communicate with each other, and different connection groups are completely isolated to achieve an anti-intrusion mechanism.

D. Start the root node's system-level communication and export-oriented allocation mechanism

- Through Mesh, the root node hierarchy distribution method is activated to achieve the operational distribution of packet flow to the exit and achieve a multi-exit mechanism.

E. Additional cost parameter settings for wireless and wired ends, manual packet flow routing,

and designated loop backup priority

- By setting the additional cost parameters for both the wireless and wired ends, the total additional cost of the entire transmission link is accumulated to achieve the flow path designation of packet transmission and the priority of repairing the connection to provide loop backup connection.

F. Amplified frequency usage and customized special channel width with anti-interference ability

- Expanded 4.9GHz and 6.1GHz wireless frequencies to accommodate more low-interference frequencies.
- Customizable non-10MHz/non-20MHz/non-40MHz wireless channel width operation modes reduce wireless interference and improve interference resistance.
- Supports multi-module network cards, 2.4/5.8GHz dual-band selection, and multi-port data flow technology.

4. EBLL4-PTMP Mesh point-to-multipoint transmission operation mode:

It features PTMP Mesh operation. PTMP Mesh provides "private, military-grade, point-to-multipoint, anti-interference, secure and encrypted transmission technology," offering over 400Mbps of point-to-multipoint aggregated client traffic bandwidth, easily supporting the bandwidth needs of 20 drones or 20 IP cameras.

PTMP operates similarly to an AP for STAs, adopting a master/slave role definition. Combined with unique software design, it offers military-grade, anti-interference, multi-layered security encryption, and support for a hen-leading-chicken mechanism. It is ideal for drone grouping applications involving a leader and wingman.

※ PTMP Mesh key features include:

A. Point-to-multipoint wireless transmission aggregation function:

- Master/slave functionality is pre-configured, allowing followers to automatically connect and transmit to the master.

- In a swarm flight system, a leader drone and wingmen can be deployed to form a complete swarm transmission system.

B. Using private military-grade wireless transmission security encryption technology

- Private security encryption mode at the underlying software layer provides military-grade security and encryption protection.
- Private security encryption mode at the wireless transmission layer is also optional and supports standard WiFi security encryption mode.
- Military-grade wireless interconnection handshake communication mode completely isolates devices from standard WiFi connections.

C. Using pre-designed host/follower segmentation, completely isolated from other general WiFi wireless devices, with a private anti-intrusion mechanism

- PTMP Mesh's pre-set Master/Slave role distinction allows for intercommunication within the same wireless group, while maintaining complete isolation between groups, effectively preventing intrusion.
- Within the traditional PTP Mesh backbone transmission architecture, PTMP Mesh can also be used to extend wireless traffic aggregation, much like a multi-level elevated interchange, funneling traffic onto the PTP Mesh wireless highway backbone!
- In drone grouping, multiple groups of Master and Slave can be configured identically. However, utilizing the signal strength differences in airspace allows wingmen to identify the optimal leader. If the leader is unable to operate due to interference, the chicks in other wingmen have the opportunity to connect to other leader drones. This prevents chicks from losing connection due to missing their leader, thanks to a special anti-interference mechanism.

5. Hi-mobile wireless high-speed mobile function operation:

A. Supports vehicle speeds exceeding 200 km/h high-speed mobile transmission applications.

B. Supports high-speed mobile transmission bandwidth exceeding 100 Mbps.

C. Supports mechanisms such as "same-frequency wireless handover" and "different-frequency wireless handover," with handover speeds of less than 50 milliseconds.

D. Supports wireless connection and transmission for more than 10 high-speed mobile devices.

E. Designs a ground station operation model for the RSU (Road Site Unit) wireless high-speed mobile signal coverage terminal, equipped with three wireless dual-band modules and a 120-degree sector antenna to provide 360-degree 3D space for high-speed mobile wireless signal coverage.

F. Designs a wireless connection and transmission operation model for the OBU (On board Unit) mobile terminal, equipped with two wireless dual-band modules and a 306-degree omnidirectional antenna to provide 360-degree 3D space for wireless connection and transmission in traffic, at sea, or at high altitude. Mechanisms such as "same-frequency wireless handover" and "different-frequency wireless handover" are used to achieve high-speed mobile wireless transmission system operation.

G. It is particularly suitable for various flight control transmission applications, such as for ships at sea and drones in the air. If a large drone is properly equipped with a sector antenna, it can achieve high-speed mobile transmission bandwidth of approximately 100Mbps over long distances of 30 km, making it suitable for specialized missions!

H. It can be used with new unmanned vehicle-specific antennas or active antennas to enhance wireless transmission signal strength, stability, and transmission distance, solving various operational challenges for mobile devices.

➢ Product Specifications

■ Hardware Specification

Main key components	
Main Processor	Qualcomm Quad core ARM Cortex A7 at 716.8MHz
Radio Frequency	■ Onboard module radio 1: 2x2 MIMO 2.4GHz, MMCX connector ■ Onboard module radio 2: 2x2 MIMO 5.8GHz, MMCX connector ■ Optional external network card radio 3: 2x2 MIMO 5.8GHz, MMCX connector ■ 4G-LTE external wireless module + SIM card interface (optional)
Wireless Spec	■ Onboard module radio 1: IEEE 802.11g/gn 2.4GHz ■ Onboard module radio 2: IEEE 802.11a/an/ac 5.8GHz ■ Optional external network card radio 3: IEEE 802.11a/an/ac 5.8GHz ■ Optional 5.8GHz wireless module enables a multi-module wireless relay hop backbone transmission architecture, achieving the benefits of high-bandwidth wireless backbone transmission. ■ 4G-LTE external wireless module: FDD LTE, TDD LTE; LTE transmission rate: 150Mbps (DL), 50Mbps (UL)
Wireless Bandwidth	■ 802.11g/gn supports 20MHz/40MHz. ■ 802.11a/an/ac supports 20MHz/40MHz/80MHz. ■ Multiple radio channel width settings allow you to choose the right channel width based on your deployment's bandwidth needs, maximizing the number of available channels and minimizing cross-band interference. ■ Utilizing 802.11gn 2T2R 2X2 MIMO HT40MHz transmission technology, TCP bandwidth reach 220Mbps ~. ■ Utilizing 802.11ac 2T2R 2X2 MIMO HT80MHz transmission technology, TCP bandwidth reach 450Mbps ~.

Memory (NOR)	32MB
Memory (RAM)	512MB
Flash memory	128MB NAND Flash

Wireless RF Specifications

	Built-in radio 1 (2.4GHz)			**Built-in radio 2 (5.8GHz)**			**External radio 3 (5.8GHz)**		
Wireless signal output power Tx Power (Per-chain)	802.11g	6M	27dBm	802.11a	6M	27dBm	802.11a	6M	27dBm
		54M	25dBm		54M	23dBm		54M	23dBm
	802.11gn	MCS0, MCS8	26dBm	802.11an	MCS0, MCS8	26dBm	802.11an	MCS0, MCS8	26dBm
		MCS7, MCS15	24dBm		MCS7, MCS15	21dBm		MCS7, MCS15	23dBm
				802.11ac	MCS0, MCS10	25dBm	802.11ac	MCS0, MCS10	25dBm
					MCS9, MCS19	19dBm		MCS9, MCS19	19dBm
Receive signal sensitivity Rx Sensitivity	802.11g	6M	-96dBm	802.11a	6M	-96dBm	802.11a	6M	-96dBm
		54M	-78dBm		54M	-78dBm		54M	-81dBm
	802.11gn	MCS0, MCS8	-93dBm	802.11an	MCS0, MCS8	-93dBm	802.11an	MCS0, MCS8	-96dBm
		MCS7, MCS15	-70dBm		MCS7, MCS15	-70dBm		MCS7, MCS15	-77dBm
				802.11ac	MCS0, MCS10	-90dBm	802.11ac	MCS0, MCS10	-96dBm
					MCS9, MCS19	-62dBm		MCS9, MCS19	-72dBm
Modulation method	802.11ag, 11agn, and 11ac all use OFDM (Supporting BPSK, QPSK, 16-QAM, 64-QAM, and 256-QAM).								

Various interface specifications	
Antenna connector	■ IOP-EBLL4-DAC1P-E500: 2 x N-type (1 onboard wireless module) ■ IOP-EBLL4-DAC2P-E250: 4 x N-type (2 onboard wireless modules) ■ IOP-EBLL4-DAC3P-E255: 6 x N-type (2 onboard wireless modules + 1 external 5GHz wireless card) Note: IOP-EBLL4-DAC1P-E500 or E200: 2 x N-type (only one onboard wireless module is enabled) ■ 4G-LTE: SMA female male thread (Optional)
Antenna combination	■ External optimized flat panel antenna model: IOP-PANFO-5M2001213 – 5.8 GHz 18-20 dBi MIMO antenna. ■ External optimized flat panel antenna model: IOP-PANFO-2M1403335 – 2.4 GHz 14 dBi MIMO antenna. ■ External optimized sector flat panel antenna model: IOP-SANFO-5M1406010 – 5.8 GHz 14 dBi MIMO H-60° to 120°/V-10° to 25° antenna. ■ External optimized sector flat panel antenna model: IOP-SANFO-2M1207525 – 2.4 GHz 12 dBi MIMO H-75° to 140°/V-25° to 45° antenna. ■ Externally connected antennas: OMNI antennas, Dish antennas, antennas for mobile wireless devices, etc. ■ Integrated optimized flat panel antenna: MBAP-RF1-PANFO-5M2001213 – 5GHz 18-20dBi MIMO H-12˚/V-13˚ antenna, housed in an aluminum die-cast IP69 waterproof enclosure. ■ Integrated optimized flat panel antenna: MBAP-RF1-PANFO-2M1403335 – 2.4GHz 14dBi MIMO H-33˚/V-35˚ antenna, housed in an aluminum die-cast IP69 waterproof enclosure. ■ Integrated Optimized Sector Antenna Model: MBAP-RF1-SANFO-5M1406010 - 5GHz 14dBi MIMO H-60° to 120°/V-10° to 25° Sector Antenna, housed in an aluminum die-cast IP69 waterproof enclosure. ■ Integrated Optimized Sector Antenna Model: MBAP-RF1-SANFO-2M1207525 - 2.4GHz 12dBi MIMO H-75° to 140°/V-25° to 45° Sector Antenna, housed in an aluminum die-cast IP69 waterproof enclosure. ■ 4G-LTE: External 1.5m Metal Waterproof 4G Antenna with Magnetic Suction Cup (Optional)

Wired network interface	■ Supports Giga Ethernet Ports X 2: 10/100/1000Mbps RJ-45 ports, supporting 10BASE-T, 100BASE-TX, and 1000BASE-T, half/full/half-duplex, auto-negotiation, and IEEE 802.3/802.3i/802.3u compliance. ■ Supports 1Gbps bandwidth transmission via multi-mode and single-mode fiber optic modules.
Input power interface	■ Passive PoE PD Ports X 2: Supports 802.3af / 3at PoE PD input mode. Power is supplied directly to outdoor wireless devices via an external Passive PoE PSE (Power Supply). ■ DC Power Supply: Inputs 24-48Vdc/3A or more. The RJ-45 Ethernet Gigabit Port functions as a data transmission port.
Protection interface	■ Supports PoE port Ethernet lightning surge protection up to 10KA @ 8/20μs. (The device has passed IEC 61000-4-5 10KA @ 8/20μs total pulse discharge current 10 times)
Power supply and demand model	
Power supply terminal	■ DC 24Vdc~48Vdc /1.5A and above, wide voltage input (insert DC connector method)
	■ Equipped with an IEEE 802.3af / 3at high-power direct-supply Passive PoE Ethernet power adapter, it provides 48Vdc/1.5A/48W output (maximum instantaneous output of 72W). (12-24Vdc DC power is input to the Passive PoE, which converts it to 48Vdc and supplies it to the Ethernet network, using 48Vdc-PoE to power wireless devices.) **Note: Passive PoE LED indicators: When DC power is input, the red LED will illuminate fully; when an RJ-45 Ethernet cable is inserted, the green LED will not illuminate!**

Device power consumption (including PoE injector)	■ IOP-EBLLX-DAC1P-XXXX-XX: ➢ Static operation power consumption is approximately 4W/h, ➢ Typical operation power consumption is less than 6W/h, ➢ The maximum power consumption during full-speed 500Mbps wireless transmission is 8W/h; ➢ The maximum power consumption during instantaneous startup is less than 12W/h. ■ IOP-EBLLX-DAC2P-XXXX-XX: ➢ Static operation power consumption is approximately 4W/h, ➢ Typical operation power consumption is less than 8W/h, ➢ The maximum power consumption during full-speed 500Mbps wireless transmission is 10W/h; ➢ The maximum power consumption during instantaneous startup is less than 16W/h. ■ IOP-EBLLX-DAC3P-XXXX-XX: ➢ Static operation power consumption is approximately 6W/h, ➢ Typical operation power consumption is less than 10W/h, ➢ The maximum power consumption during full-speed 500Mbps wireless transmission is 14W/h; ➢ The maximum power consumption during instantaneous startup is less than 20W/h.
Physical size and weight	
Size	■ Flat top cover version: L268mm x W268mm x H80mm (H90 with bleed valve) ■ Raised top cover version: L268mm x W268mm x H108mm (H118 with bleed valve) ■ Double bottom cover locking version: L268mm x W268mm x H140mm (H150 with bleed valve) ■ All-in-one top cover antenna version: L266mm x W266mm x H110mm (H120 with bleed valve) ■ Add 72mm to the height after mounting bracket assembly ■ Wireless PCBA mainboard dimensions: 115mm x 105mm x 16mm / 8mm

Weight and packaging	■ Device Weight: 3.0kg–3.2kg / All-in-one Weight: 2.4kg–2.5kg (depending on the number of connectors) ■ Product Packaging (including PoE injector and mounting bracket) 4.0kg–4.5kg ■ Shipping Carton, holds 2 boxes weighing 9kg each
Operating environment resistance specifications	
Operating temperature range	The operating temperature range is -40 ~ 70℃, and it can withstand high temperatures in sunlight up to 45℃ ambient temperature and 75℃ internal temperature in sunlight.
Storage temperature	-40 ~ 105℃
Operating humidity	0% ~ 95% Operating
Storage humidity	0% ~ 90% Storage (non-condensing)
Dust and water resistance level	Outdoor IP69 rating. (Tested by exposing the device to 80°C steam for two minutes and 100 bar high-pressure water jets at 0-90°C from top to bottom.)
Case material, protection and installation standards	■ Aluminum die-cast housing with a corrosion-resistant paint finish. ■ The aluminum die-cast housing is up to 3.5mm thick, providing enhanced resistance to external electromagnetic interference and corrosion in coastal and other harsh environments. ■ Designed to meet VESA international standards – 75mm x 75mm for indoor/outdoor mounting.
Ethernet lightning surge protection	■ Supports PoE port Ethernet lightning surge protection up to 10KA @ 8/20μs.
ROHS compliance	Yes

Product related certification	
Wireless Product Certification	■ Taiwan NCC wireless radio frequency certification, certification number NCC CCAH24LP2980T5. ■ Taiwan TAICS wireless product safety certification (Pending) ■ Wireless product certification in other countries or regions (Pending)
Four types of dust and water resistance certification for casing and interface	■ Flat top cover version (can be integrated with a second wireless PCBA): ➢ IP69 dust and water resistance certification. ■ Raised top cover version (can be integrated with other 4G / 5G routers / PLCs / NBIoT / LoRa / BT / network switches, etc.): ➢ IP69 dust and water resistance certification. ■ Double locking bottom cover version (can be integrated with a high-temperature and low-temperature resistant explosion-proof mobile DC UPS 24Ah-300W power supply system): ➢ IP69 dust and water resistance certification. ■ Antenna top cover version (top cover with a metal backplane for a flat antenna, forming an all-in-one product): ➢ IP69 dust and water resistance certification.

International VESA standard
-- universal stainless steel mounting bracket

Universal VESA Stainless Steel Wind-Resistant Mount

Mount Model:
IOP-UHMK-VESA75-1

1. Compatible with VESA international standard – 75 x 75mm in/outdoor mounting for various equipment
2. Compatible with general engineering equipment standard - 60mm x 60mm indoor/outdoor mounting for various equipment
3. Supports triangular mounting points
4. Supports screw mounting points
5. Supports +/- 40° vertical antenna angle adjustment
6. Supports wall mounting (also supports vehicle mounting)
7. Supports pole mounting, supporting pole diameters from 0.5 to 2.5 inches
8. Supports streetlight pole mounting (8-inch pole tie / tie width: 15mm / tie thickness: 2mm)
9. Supports utility pole mounting (12-inch pole tie / tie width: 15mm / tie thickness: 2mm)
10. Assembled dimensions: L x W x H: 125 x 125 x 77mm / thickness: 1.2mm
11. Wind load capacity: Can withstand wind pressures up to level 17 (over 250 km/hr/Beaufort scale 17).
12. Supports non-slip wall screw holes.
13. Stainless steel accessories:

-- U-shaped screws x 2
-- M6 hex nuts with washers x 4
-- M5 x 8mm hex Phillips screws with washers x 9
-- M5 x 12mm hex Phillips screw with washers x 1

■ Software Specification

Network switching bridging and wireless routing software functions	
Wireless bridge and wireless router Operation mode	■ Network Transparent Bridge: Supports AP/STA / PTP Mesh (Transparent Bridge Mode) / PTMP Mesh ■ Network Wireless Router: Supports Bridge Mode DHCP / Router Mode with DHCP
Wireless Device Software Operational Features	
System operation mode	■ EBLL4-DACXP – AP/STA/PTP Mesh/PTMP Mesh (Network Transparency Bridging) (Basic Function) ➢ AP/STA wireless connection service and client wireless transmission system technology. ➢ PTP Mesh point-to-point closed private wireless loop backup backbone transmission system technology. ➢ PTMP Mesh point-to-multipoint closed private wireless aggregation transmission system technology. ■ EBLL4-DACXP – HM-Hi-mobile high-speed mobile wireless transmission technology (including AP/STA/PTP & PTMP Mesh functions). (Optional) ■ EBLL4-DACXP – H4-4G-LTE + Hi-mobile high-speed mobile wireless transmission technology (including AP/STA/PTP & PTMP Mesh functions). (Optional)
Wireless multi-module and multiple export interfaces	■ Supports up to three wireless multi-modules, dynamically assigning multiple modes of access for both wired and wireless networks. Switchable to various transmission modes, including AP, STA, PTP Mesh, PTMP Mesh, or Hi-Mobile, based on operational needs. ■ Supports a 4G-LTE external wireless module + SIM card interface, providing WAN access. (Optional) ■ Supports fiber optic module interfaces, providing 1Gbps bandwidth for WAN access. ■ Supports USB 3.0 digital data stream transmission for USB IP Cam use (Optional) ■ Supports MICRO SD card access for storage capacity (Optional)

Supports multi-hop low-loss bandwidth ◆ **AP/STA Hops** ◆ **PTP Mesh Hops** ◆ **Hi-mobile Fiber Hops**	■ Multiple multi-point relay hop technologies enable continuous relay and hop transmission when encountering obstacles such as buildings, hillside terrain, or forests, resolving transmission obstructions through multiple relay hops. ■ Up to 250 continuous wireless relay hops are possible (10 or fewer is recommended), enabling packet transparent transmission, switching, and distributed forwarding. ■ The wireless bandwidth of various relay hops is reduced by 10-20 Mbps per hop through packet switching, achieving low-loss bandwidth performance. Even after 10 consecutive hops, bandwidth of over 300 Mbps (@ HT800MHz) can still be maintained. ■ The transmission delay of various relay hops is reduced by 1ms per hop and an additional 2ms after three hops through switching echo technology. After 10 consecutive hops, the delay is maintained under 30ms. ■ Supports Hi-mobile high-speed fiber cable with wired/wireless relay hopping transmission function mechanism.
Hi-mobile high-speed mobile transmission (Optional)	■ Specialized Hi-Mobile high-speed mobile transmission wireless equipment supports vehicle speeds exceeding 200km/h, mobile transmission bandwidth exceeding 100 Mbps, and a handover connection speed of 50ms, providing unique applications for high-speed mobile wireless transmission systems. ■ Hi-Mobile high-speed mobile technology is particularly suitable for connection and transmission of unmanned mobile devices, such as drones, unmanned vehicles, unmanned ships, and robots. ■ Paired with a large-scale mesh backbone deployment using PTP Mesh multi-point relay stations, it achieves both ground-based mesh network and high-altitude high-speed mobile mesh wireless signal coverage, effectively resisting electronic signal interference.
MPTMP MESH Network (Project Purchase)	■ Specialized MPTMP MESH Network wireless equipment, with automatic mesh networking, optimal routing, multi-path redundancy, automatic repair, multiple egress, and other wireless mesh network features. **(Tentative, not yet released!!)** (MPTMP Mesh : Multi Point to Multi Point Mesh Network)

Data security encryption and equipment security management	
Data security encryption	■ The PTP Mesh network system offers military-grade security features for a dedicated, private wireless transmission system. ■ PTP Mesh operation mode features wireless group security mechanisms using a Main Group ID and Link IDs. This military-grade encryption replaces lower-level encryption methods such as Wi-Fi Protected Protocol (WEP). ■ It also features a Service Provider Identity (SSID) wireless security mechanism. ■ It supports WPA/WPA2 AES key encryption.
Equipment safety management	■ User-friendly interface with user account and password input for security. ■ Private wireless transmission technology provides PTP Mesh, PTMP Mesh, and Hi-Mobile transmission capabilities, achieving interference resistance. ■ Unique design for designated and extended frequency ranges to achieve interference resistance.
System management and system maintenance functions	
System management functions	■ Supports HTTP(S) WEB GUI operation and management via a web browser. ■ Supports client network time synchronization as NTP Client, DHCP Client, DHCP Server, NAT, and Firewall. ■ Supports dual-image firmware upgrades. If a firmware update on a device causes system malfunction, the dual-image firmware upgrade design can quickly restore the system to normal operating settings.

System maintenance function	■ Supports hardware/software watchdog mechanisms. ■ Supports the web-based scanning and detection of operating device lists in the MeshMgmt_VMSrv simple network management software. ■ Synchronize Pos. Updates GPS coordinate data via 4G (project purchase). ➢ Time (Seconds): The time in seconds after which GPS coordinate data must be updated. ➢ Offset (M): The offset in meters after which GPS coordinate data must be updated. ■ Schedule Reboot: Automatically restart wireless devices daily, weekly, or monthly through pre-set schedules.
System construction and erection auxiliary tools	
Wireless signal scanning and connection status assistance tool	1. Features a wireless environment detection and scanning function, providing a reference for wireless engineers to determine channel selection. 2. Supports dynamic wireless signal, transmission rate, and traffic display, helping wireless engineers assess wireless system stability. 3. Supports mutual detection between on-site and remote wireless devices, displaying information such as link signal strength, transmission rate, and encryption status, enabling wireless engineers to determine the signal status of both ends of the wireless system during future maintenance. 4. Features a tool for pre-assessing the wireless system's RSSI signal strength, facilitating antenna gain optimization before installation. 5. Enable Heartbeat enables heartbeat detection. UDP packets are sent to the UDP port of the specified IP host (can be sent to multiple IP hosts simultaneously) every specified number of seconds to record whether the wireless device is alive and operating normally. This can be used for system device network management monitoring and to determine the success of OBU-RSU connections and wireless switching for drones, vehicles, ships, robots, etc.

	6. Enable Internet Backup Link enables the Internet backup link, providing the following six Multi-WAN redundancy mechanisms: 6-1. Ethernet Port 1 6-2. Ethernet Port 2 (or Fiber Port) 6-3. WiFi RF1 - 2.4GHz (or PTP MESH Backbone) 6-4. WiFi RF2 - 5GHz (or PTP MESH Backbone) 6-5. WiFi RF3 - 5GHz (or PTP MESH Backbone) 6-6. 4G-LTE (Telecom Network)
Antenna calibration, transmission bandwidth, and packet loss rate test tool	1. After antenna installation, the built-in software performs a wireless antenna calibration and adjustment mechanism. This mechanism obtains local and remote wireless RSSI signal strength information, wireless transmission rate detection, and polarization signal strength changes to help determine antenna alignment and facilitate antenna adjustment. 2. Software testing of wireless link bandwidth traffic transmission is supported to confirm that the wireless system's transmission bandwidth exceeds 150Mbps. The packet loss rate is also displayed to help assess connection stability. 3. TCP traffic testing based on the "Iperf test mode" simulates TCP packet transmission traffic between a specified device IP address and another device IP address.

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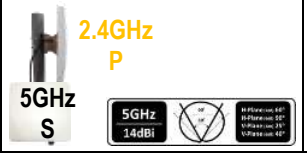
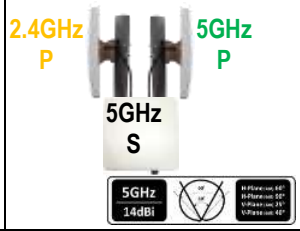
➢ Packaging and accessories

- IOP-EBLLX-DAC4P EXXX-XX 802.11ag/agn/ac outdoor wireless AP/bridge/router.
- 802.3af/at 1Gbps 48V 1.5A Passive PoE high-power Ethernet injector.
- AC 100V~240V to DC 19V/4.74A adapter with a US AC Code 1.5m power cord.
- IOP-UHMK-VESA75-1 VESA universal stainless steel wind-resistant mounting bracket, suitable for pole, lamppost, and wall mounting.

Special Notes:

Outdoor WiFi MIMO Wireless Base Station Antenna Model Comparison

No	Product Model	Identification method	With top cover antenna type			
			5GHz Patch antenna	2.4GHz Patch antenna	5GHz Sector antenna	2.4GHz Sector antenna
1	EBLL4-DAC1P P500 (or EBLL4-DAC2P P500)	No colored antenna type label				
2	EBLL4-DAC1P P200 (or EBLL4-DAC2P P200)					
3	EBLL4-DAC1P S500 (or EBLL4-DAC2P S500)					
4	EBLL4-DAC1P S200 (or EBLL4-DAC2P S200)					
5	EBLL4-DAC2P P520 RF1-2.4GHz Top chassis RF2-5GHz Patch Antenna	5GHz Patch Antenna External 2.4GHz Patch antenna				
6	EBLL4-DAC1P P250 RF1-2.4GHz Patch Antenna RF2-5GHz Top chassis	2.4GHz Patch Antenna External 5GHz Patch antenna				
7	EBLL4-DAC1P S520 RF1-2.4GHz Top chassis RF2-5GHz Sector Antenna	5GHz Sector Antenna External 2.4GHz Patch antenna				

8	EBLL4-DAC1P S250 RF1-2.4GHz Sector Antenna RF2-5GHz Top chassis	2.4GHz Sector Antenna External 5GHz Patch antenna				
9	EBLL4-DAC2P P525 RF1-2.4GHz Top chassis RF2-5GHz Patch Antenna RF3-5GHz Under chassis	5GHz Patch Antenna External 2.4GHz Patch antenna External 5GHz Patch antenna				
10	EBLL4-DAC1P P255 RF1-2.4GHz Patch Antenna RF2-5GHz Top chassis RF3-5GHz Under chassis	2.4GHz Patch Antenna External 5GHz Patch antenna External 5GHz Patch antenna				
11	EBLL4-DAC1P S525 RF1-2.4GHz Top chassis RF2-5GHz Sector Antenna RF3-5GHz Under chassis	5GHz Sector Antenna External 2.4GHz Patch antenna External 5GHz Patch antenna				
12	EBLL4-DAC1P S255 RF1-2.4GHz Sector Antenna RF2-5GHz Top chassis RF3-5GHz Under chassis	2.4GHz Sector Antenna External 5GHz Patch antenna External 5GHz Patch antenna