**FIBERROAD**

# AI PoE Series

# COMMERCIAL GRADE GIGABIT POE SWITCH

## User Manual

# AI PoE Switch

This user manual describes installing and using the AI PoE Switch.

## Instruction



### ❖ DIP Switch

| DIP Switch | Name | Status | Description |
|---|---|---|---|
| #1 | AI Extend | OFF | Disable |
| | | ON | Enable |
| #2 | AI VLAN | OFF | Disable |
| | | ON | Enable |
| #3 | AI QoS | OFF | Disable |
| | | ON | Enable |
| #4 | AI PoE | OFF | Disable |
| | | ON | Enable |

Notes: 1. AI Extend: AI extend is a common PoE switch feature designed to extend PoE distance up to 250m. The downside is that port speeds will be limited to only 10Mbps. This limitation does not apply to the uplink ports. The AI Extend feature is suitable for situations where your power source is too far away. There is, however, that bandwidth limitation to be aware of.

2. AI VLAN: AI VLAN is essentially port isolation on each of the PoE ports. All PoE ports are only able to communicate with the uplinks when this option is enabled. This can be useful when the setup requires multiple clients to connect to a common network resource but should not be able to connect to each other. Using this also improves network security.

3. When AI QoS is enabled on the 8 port models, Port 1 - 4 will prioritise Video and VoIP traffic flows over others. For example, an IP camera streaming in real-time takes preference over a user transferring a backup file to a server.

4. AI PoE: The AI PoE feature allows the switch to check the ports for activity periodically. If a port is not passing traffic for a certain amount of time, the switch will reset the power on that specific port. The device on the other end will reboot with the idea that it returns to a working state. This is a great feature to automate this process. It can save lots of time on support and driving out to the site to troubleshoot or manually power cycle equipment.

## ❖ PoE & Power Supply

**PoE & Power Supply**

| Model | FR-5A3416P | FR-5A3424P |
|---|---|---|
| PoE Ports | Port 1 to 16 IEEE802.3af/at @PoE | Port 1 to 24 IEEE802.3af/at @PoE |
| Power Supply Pin | Default: 1/2(+), 3/6(-),Optional:4/5, 7/8(-) | |
| Max Power Per Port | 30W; IEEE802.3af/at | |
| Total PWR | 250W@15.4W / port<br>480W@30W / port | 250W@15.4W /port<br>720W@30W /port |
| Power Consumption | < 15W(220/50 Hz, no PD connected) | < 18W(220/50 Hz, no PD connected) |
| Power Inputs | 1 | |
| Power Supply | Internal power adapter with AC100 – 240V 50-60Hz input | |
| Protection | Overload Current Protection | |
| AC Power Plug Types |  | |
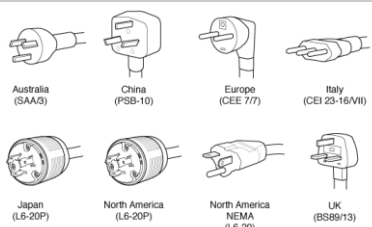
## ❖ Optical Fiber Port

**SFP Transceiver Module**

You can select different SFP modules as required (Please refer to our SFP selection list for the appropriate module). To insert/remove the SFP, the procedures are as follow:

1. On the side panel, insert the SFP module into the SFP port until it is securely locked.
2. Connect the optical fiber (1/2 core) to the LC connector(s) of the SFP.
3. To remove the SFP module, press down the lock of the LC connector of the optical fiber to pull out the fiber cable.
4. Pull down the SFP lever and hold its position. Pull out the SFP module from the SFP port.
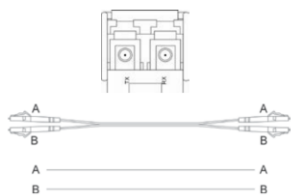


Notes: If you make your own cable, we suggest labeling the two sides of the same line with the same letter (A-to-A and B-to-B, shown as below, or A1-to-A2 and B1-to-B2).

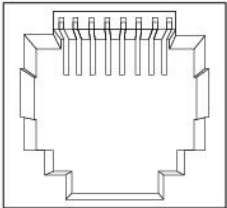| Connector | Multimode Fiber | | Sigle-mode Fiber | |
|---|---|---|---|---|
| 1000Base-SX(850nm) | Bandwidth MHZ-KM | Distance | Bandwidth MHZ-KM | Distance |
| | 260 | 220m | 400 | 500m |
| | 200 | 275m | 500 | 550m |
| 1000Base-LX (1310nm/1550nm) | Single-mode Fiber 9/125um:2km<br>Single-mode Transceiver 1310nm: 10/20km<br>Single-mode Transceiver 1550nm: 40-120km | | | |

### ❖ The Port Status LEDs (FR-POE233)

| LED | State | Indication |
|---|---|---|
| PWR | On | Power On |
| | Off | Power Off |
| LINK/ACT | On | Valid Ethernet Link |
| | Blink | Data Transmission |
| | Off | No Ethernet Link |

### ❖ RJ45 Ethernet Port

RJ 45 port support automatic MDI/MDI-X operation. Can connect the PC, Server, Converter and HUB .Pin 1,2,3,6 Corresponding connections in MDI. 1→3, 2→6, 3→1, 6→2 are used as cross wiring in the MDI-X port of Converter and HUB. 10/100/1000Base-TX are used in MDI/MDI-X, the define of Pin in the table as below.

| 1000Mbps 1000Base-T, RJ45 Connector Pin Assignment | | |
|---|---|---|
| Pin | MDI Signal Definition | MDIX Signal Definition |
| 1 | BI_DA+ | BI_DB+ |
| + | BI_DA- | BI_DB- |
| 3 | BI_DB+ | BI_DA+ |
| 4 | BI_DC+ | BI_DD+ |
| 5 | BI_DC- | BI_DD- |
| 6 | BI_DB- | BI_DA- |
| 7 | BI_DD+ | BI_DC+ |
| 8 | BI_DD- | BI_DC- |

| 10/100Mbps 10/100Base-T, RJ45 Connector Pin Assignment | | |
|---|---|---|
| Pin | MDI Signal Definition | MDIX Signal Definition |
| 1 | TD+ | RD+ |
| 2 | TD- | RD- |
| 3 | RD+ | TD+ |
| 4 | NC | NC |
| 5 | NC | NC |
| 6 | RD- | TD- |
| 7 | NC | NC |
| 8 | NC | NC |

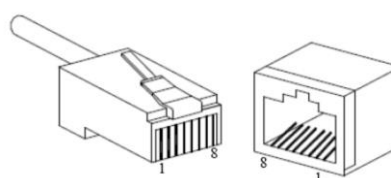| Pin | Label |
|---|---|
| 1 | TP0+ |
| 2 | TP0- |
| 3 | TP1+ |
| 4 | TP2+ |
| 5 | TP2- |
| 6 | TP1- |
| 7 | TP3+ |
| 8 | TP3- |

Figure 1  10/100/1000M Lan Port Pinouts

As aforementioned, an Ethernet crossover cable is adopted to connect two ports of the same configuration (i.e. MDI-to-MDI or MDIX-to-MDIX). However, it may generate some confusion and inconveniences when deploying two different kinds of Ethernet cables. The auto-MDI/MDIX technology is developed to fix this problem: It automatically switches between MDI and MDIX as required. Auto MDI/MDIX ports on newer device interfaces detect if the connection requires a crossover, then automatically choose the MDI or MDIX configuration to properly match the other end of the link. In this case, it doesn't matter if you using straight through or crossover cables. The chart below shows cable types for MDI/MDIX and auto-MDIX.

| Setting | MDI/MDIX Device Type | |
|---|---|---|
| | PC or other MDI Device | Switch, hub or other MDIX Device |
| MDI | Crossover cable | Straight-through cable |
| MDIX | Straight-through cable | Crossover cable |
| Auto-MDI/MDIX | Either crossover or straight-through cable | |

❖ **Power over Ethernet(PoE) Pinout Diagram**

Power over Ethernet or PoE is a standard system that transmits or delivers electrical power along with data through the same cable. We know that there are different types of network cables are available such as cat6, cat7, cat5, etc, and different types of ports also available such as RJ45. RJ45 has a total of eight pins and it connects with an ethernet cable that consists of eight separate wires. All these eight wires are not used for the data transmission, so some of them can be used for electrical power transmission. As per the standard, the electrical current should interface with the data transmission and the cable should be safe.

The Power over Ethernet system works under the standardization of the (Institute of Electrical and Electronics Engineers)IEEE 802.3 committee. Generally, PoE delivers 47-57V DC power. This PoE system is used for both data and power transmission purposes in Internet Protocol(IP) cameras, Wireless Access points(WAPs), Voice over Internet Protocol(VoIP), etc.

According to the IEEE standard cat5 or better cable is required for the transmission of high power levels. But cat3 cable also can be used if less power transmission is required. The PoE system was physically implemented under the specification of IEEE 802.3af-2003. Also, we know that there are two categories for the RJ45 colour code - T568A and T568B.

❖ **IEEE 802.3af -2003 Standard PoE Pinout Diagram for T568A**

| No. | Description |
|---|---|
| 1 | White Green(TX+) |
| 2 | Green(TX-) |
| 3 | White Orange(RX+) |
| 4 | Blue(DC+) - PoE |
| 5 | White Blue(DC+) - PoE |
| 6 | Orange(RX-) |
| 7 | White Brown(DC-) - PoE |
| 8 | Brown(DC-) - PoE |

| No. | Description |
|---|---|
| 1 | White Orange(TX+) |
| 2 | Orange(TX-) |
| 3 | White Green(RX+) |
| 4 | Blue(DC+) - PoE |
| 5 | White Blue(DC+) - PoE |
| 6 | Green(RX-) |
| 7 | White Brown(DC-) - PoE |
| 8 | Brown(DC-) - PoE |

*Hold the copper strips toward your face

## ❖ Installation Preparation

Before installation, confirm that the work environment meets the installation requirements, including the power needs and abundant space. Whether it is close to the connection equipment and other equipment are prepared or not.

1. Avoid in the sunshine, keep away from the heat fountainhead or the area wherein intense EMI.
2. Examine the cables and plugs that installation requirement.
3. Examine whether the cables be seemly or not (less than 100m) according to a reasonable scheme.
4. Power: DC52V power input
5. Environment:
   working temperature: 0 ~ 50℃ (32 to 122℉)
   Storage Temperature: -20 ~ 70℃  (-4 to +158℉)
   Relative humidity 5% ~ 95%  (noncondensing)

## ❖ Rack Mount Installation

To install the PoE Switch in a 19-inch standard rack, follow the instructions described below.
Step 1: Place the PoE Switch on a hard flat surface, with the front panel positioned towards your front side.
Step 2: Attach a rack-mount bracket to each side of the PoE switch with supplied screw attached to the package.
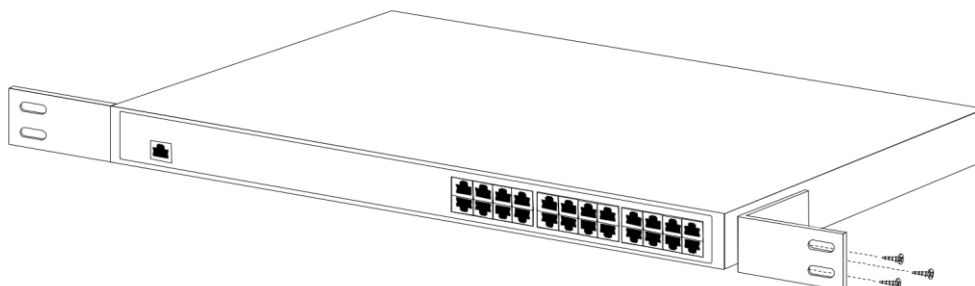


Figure 2-1 shows how to attach brackets to one side of the PoE switch

NOTE： You must use the screw supplied with the mounting brackets. Damage caused to the parts by using incorrect screws would invalidate the warranty.

Step 3: Secure the brackets tightly.
Step 4: Follow the same steps to attach the second bracket to the opposite side.
Step 5: After the brackets are attached to the injector, use a suitable screw to securely attach the brackets to the rack, as shown in Figure 2-2.
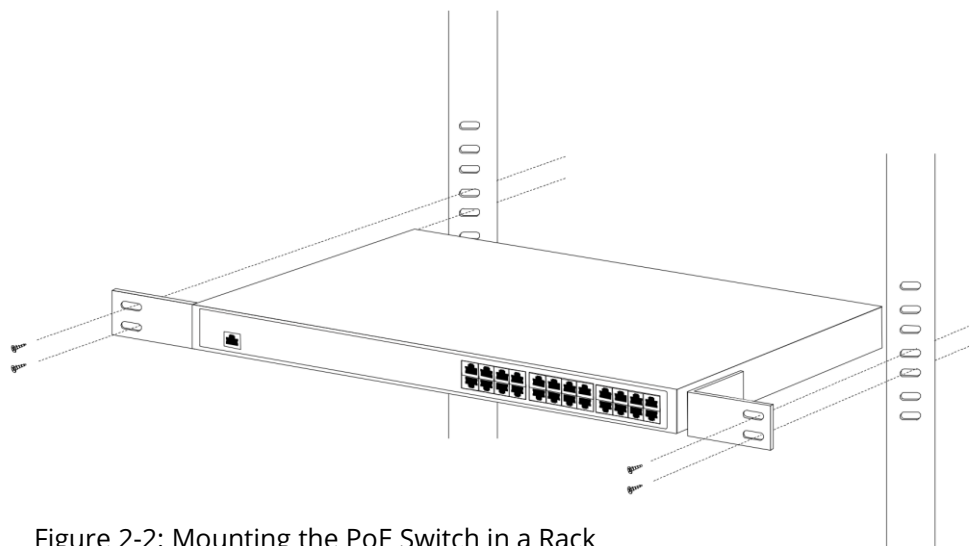
Figure 2-2: Mounting the PoE Switch in a Rack

### ❖ Wiring Requirements

Cable laying need to meet the following requirements,
1. It is needed to check whether the type, quantity and specification of cable match the requirement before cable laying;
2. It is needed to check the cable is damaged or not, factory records and quality assurance booklet before cable laying;
3. The required cable specification, quantity, direction and laying position need to match construction requirements, and cable length depends on actual position;
4. All the cable cannot have break-down and terminal in the middle;
5. Cables should be straight in the hallways and turning;
6. Cable should be straight in the groove, and cannot beyond the groove in case of holding back the inlet and outlet holes. Cables should be banded and fixed when they are out of the groove;
7. User cable should be separated from the power lines. Cables, power lines and grounding lines cannot be overlapped and mixed when they are in the same groove road. When cable is too long, it cannot hold down other cable, but structure in the middle of alignment rack;
8. Pigtail cannot be tied and swerved as less as possible. Swerving radius cannot be too small (small swerving causes terrible loss of link). Its banding should be moderate, not too tight, and should be separated from other cables;
9. It should have corresponding simple signal at both sides of the cable for maintaining.

❖ **Power over Ethernet Powered Device**

| | |
|---|---|
|  | **Voice over IP Phones**<br>**(3-5 Watts)** |
|  | **IP Camera**<br>**(10-12 Watts)** |
|  | **Wireless LAN Access Points**<br>**(6-12 Watts)** |
|  | **PAN/Tilt/Zoom Cameras**<br>**(30 Watts)** |
|  | **Remote Computer**<br>**(30 Watts)** |

❖ **PoE Power Supply Budget Calculation**
**Step1: Add Up The Demand For PoE In Watts**
**Add up the expected demand for power for each Powered Device (PD) in watts.** Allow for the maximum power and upper end of PD classification. Any unspecified devices should be assumed Class 0.

For example, an IEEE802.3af, Class 0 device may consume 9 watts; however, as it's Class 0, assume 15.4 watts.

**Round the numbers up**, occasionally, to account for the additional consumption of the UTP (unshielded twisted-pair) ethernet cable that runs between the PD and PoE switch.

For example, if an IEEE802.3at Class 4 IP camera consumes 25.5 watts, round to 30 watts, which adds a buffer to balance out the loss between the PoE switch and the device.

**Include room for future capacity.** It's convenient to have at least one spare port for diagnostics, troubleshooting, or monitoring. And many clients want extra ports for the option to add more PD devices in the future. However, as long as devices are appropriately selected and integrated, accounting for spare ports isn't required for a PoE power budget calculation.

**Step 2: Scale For The Operating Environment**
When performing a PoE power budget calculation, it's essential to account for environmental conditions.
**Accommodate for the conditions.** Expect the long-term performance of a power supply to be 70% of its rating in a benign/conditioned environment (somewhere with steady temperatures between 32°F/0°C and 120°F/50°C). In a benign environment, divide the total wattage from step one by 0.7.
If the power supply is subject to a harsh environment (cold temperatures less than 32°F/0°C or heat above 120°F/50°C), plan for diminished performance. Divide the total wattage from step one by 0.6 for this type of setting.
In extreme conditions, industrial-grade modes, such as Fiberroad Industrial PoE Series, DIN rail mountable, and DC 48V power supplies.
**Take this harsh scenario, for instance:**
A switch and its power supply will be stored in a metal enclosure, exposed to direct sun, at a site in the northeastern United States. In winter, the temperature inside the enclosure could be as low as –10°F/–24°C. And in summer, it could be as high as 140°F/60°C. Accounting for the temperature inflexions, expect the power supply to operate at 60% of its power rating.
It's always safe to assume a conservative long-term performance drop of 50%, no matter the conditions. That means totalling the anticipated power demand (step 1) and dividing by 0.5 (step 2) to get a power budget in watts.
**Step 3: Select The Power Source**
After determining the demand for PoE power and accounting for the surroundings, it's time to select an appropriate supply. Fiberroad has DC 48-56V supplies with ratings from 30 watts to 480 watts.

❖ **Troubleshoot**
● Please follow this step if the equipment have trouble.
● Make sure the equipment is installed according to the manufactures installation guide.
● Confirm RJ45 cable order meets EIA/TIA568A or 568B standard.
● Every PoE port can provide PoE equipment with a maximum power of less than 30W; please do not connect the PoE equipment with control over 30W.
● Replace the equipment that can not work with a proper functioning 8port PoE Ethernet switch to check if the equipment is damaged.
● Please get in touch with your vendor if trouble still exists.

## ❖ Specifications

### Ethernet Interface

| | | |
|---|---|---|
| Model | FR-5A3416P | FR-5A3424P |
| RJ45 Port | 16x10/100/1000Base-TX | 24x10/100/1000Base-TX |
| Optical Fiber Port | 2x1000Base-X SFP | 2x1000Base-X SFP |
| SFP Slot Port | Gigabit SFP optical fiber interface, default matching optical modules (optional order single-mode / multi-mode, single fiber / dual fiber optical module. LC) | |
| Twisted Pair Transmission | 10BASE-T: Cat3,4,5 UTP(≤100 meter)<br>100BASE-TX: Cat5 or later UTP(≤100 meter)<br>1000BASE-T: Cat5e or later UTP(≤100 meter) | |
| Port Mode(Tx) | Auto-Negotiation<br>Full/Half Duplex Mode<br>Auto MDI/MDI-X Connection | |
| Standards | IEEE 802.3 for 10BaseT<br>IEEE 802.3u for 100BaseT(X) and 100BaseFX<br>IEEE 802.3ab for 1000BaseT(X)<br>IEEE 802.3z for 1000BaseSX/LX/LHX/ZX<br>IEEE 802.3x for flow control<br>IEEE 802.1p for Class of Service<br>IEEE802.3az Energy Efficient Ethernet | |
| Packet Buffer Size | 4Mbits | |
| Maximum Packet Length | Up to 10K | |
| MAC Address Table | 8K | |
| Transmission Mode | Store and Forward (Full Wire Speed) | |
| Exchange Property | Delay time: < 7μs<br>Backplane bandwidth: 52Gbps | |
| Advanced Features | Compatible With IEEE 802.3at/af Compliant PDs<br>Extend Mode (Up to 250m PoE power supply and data transmission)<br>Priority Mode<br>Isolation Mode<br>PD Detection<br>Intelligent Power Supply<br>Mac Address Auto-Learning and Auto-Aging | |

### Working Environment

| | |
|---|---|
| Operating Temperature | 0℃~50℃ (32to 122 ℉) |
| Operating Humidity | 5%~90% (non-condensing) |
| Storage Temperature | -20℃~70℃ (-4 to 158 ℉) |
| MTBF | 100,819 Hours |
| MTBF Standard | Telcordia SR-332 GB 25℃ |
| Cooling | Fanless, Passive Cooling |
| Noise Level | 0 dBA |

## ❖ Regulatory Information

### 1.1 Electronic Emission Notices

This equipment has been tested and found to comply with the FCC Part 15, Subpart B, Class A and protection requirements of European Emission Standard as follows: EMI Comply with FCC Part 15 Class A & CE Mark Approval LVD EN 62368-1 Safety UL and others by request

### 1.2 FCC Class a statement

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

### 1.3 Disclaimer

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