# IFS MC251-4P/1S and NS2051-4P/1T User Manual

## Overview

The MC251-4P/1S Industrial 802.3af Power over Ethernet Media converter and NS2051-4P/1T 802.3af PoE switch fully comply with the IEEE 802.3 10Base-TX and IEEE 802.3u 100Base-TX standards. The MC251-4P/1S and the NS2051-4P/1T Industrial 802.3af Power over Ethernet Media converters also supports IEEE 802.3x flow control and back pressure standard in half-duplex to eliminate packet loss.

## Package contents

Unless specified, the term "**industrial fast Ethernet switch**" mentioned in this user manual refers to the MC251-4P/1S and the NS2051-4P/1T.

Open the box of the industrial fast Ethernet switch and carefully unpack it. The box should contain the following items:

- Industrial fast ethernet switch × 1
- CD with user manual × 1
- DIN rail kit × 1
- Wall-mount kit × 1

If any of these are missing or damaged, please contact your dealer immediately. If possible, retain the carton including the original packing material, and use them again to repack the product in case there is a need to return it to us for repair.

## Product features

### Physical port

| Model Name | Ports | | Fiber Optical Interface | | |
|---|---|---|---|---|---|
| | Copper | Optical | Mode | Connector | Distance |
| NS2051 -4P/1T | 5 x 10/100Base-TX | NA | NA | NA | NA |
| MC251-4P/1S | 4x 10/100Base-TX | 1 x 100Base-FX | Depends on SFP Module | Depends on SFP Module | Depends on SFP Module |

### IEEE 802.3af PoE

- Complies with IEEE 802.3af Power over Ethernet End-Span PSE

- Up to four IEEE 802.3af devices powered
- Supports PoE Power up to 15.4 W for each PoE port
- Auto detect powered device (PD)
- Circuit protection prevent power interference between ports
- Remote power feeding up to 100 m

### Layer 2 features

- Complies with IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX / 100Base-FX Ethernet standard
- Supports Auto-Negotiation,10/100Mbps Half / Full Duplex and Auto MDI/MDI-X
- High performance Store and Forward architecture, Runt/CRC filtering eliminates erroneous packets to optimize the network bandwidth
- Prevents packet loss with Back Pressure (Half-Duplex) and IEEE 802.3x PAUSE Frame Flow Control (Full-Duplex)
- Backplane (Switching Fabric): 1 Gbps
- Automatic address learning and address aging
- Integrated address look-up engine, supports 2K absolute MAC addresses
- CSMA/CD Protocol

### Industrial case / installation

- IP-30 Aluminum Metal case / Protection
- DIN Rail and Wall Mount Design
- Redundant Power Design: 24 or 48 VDC, redundant power with polarity reverse protect function
- Supports EFT protection 6000 VDC for power line
- Supports 6000 VDC Ethernet ESD protection
- -40 to 75°C operating temperature

## Installation

This section describes the functionalities of the Industrial Fast Ethernet components and guides how to install it on the desktop. Basic knowledge of networking is assumed. Please read this chapter completely before installation.

## Product Description

The IFS MC251-4P/1S and the NS2051-4P/1T are 5-Port 10/100Mbps with 4-Port PoE unmanaged industrial fast Ethernet switches and provide non-blocking wire-speed performance in an IP-30 aluminum metal enclosure for easy deployment in harsh industrial demanding environments.

The PoE in-line power follow the standard IEEE 802.3af and permits the powering of four PoE compliant devices at distance of up to 100 meters through the 4-pair Cat 5 / 5e UTP wire. With Data and Power over Ethernet from one unit, the MC251-4P/1S and the NS2051-4P/1T reduces cable deployment and eliminates the need for dedicated electrical outlets on the wall, ceiling, or any hard to reach locations.

With 1 Gbps internal switching fabric, the industrial fast Ethernet switch can handle large amounts of data in a secure topology linking to a backbone or high capacity servers.
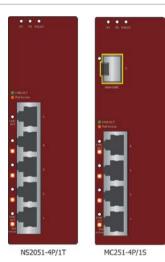
The industrial fast Ethernet switch has a 2K MAC address table and offers wire-speed packets transfer performance without risk of packet loss. The stable throughput of the device makes it ideal for most Ethernet environments.

All RJ-45 copper interfaces support 10/100Mbps Auto-negotiation for optimal speed detection through RJ-45 Category 3, 4, 5, 5e or 6 cables. Support standard for Auto-MDI/MDI-X that can detect the type of connection to any Ethernet device without requiring special straight or crossover cables.

The Flow Control function allows industrial fast Ethernet switch supported routers and servers to directly connect to this device for fast, reliable data transfer.

## Switch front panel

**Figure 1: Industrial fast Ethernet switch front panels**



NS2051-4P/1T          MC251-4P/1S

## LED indicators

### System

| LED | Color | Function |
|-----|-------|----------|
| P1 | Green | **Lit**: indicates power 1 has power. |
| P2 | Green | **Lit**: indicates power 2 has power. |
| FAULT | Green | Lit: indicates either power 1 or power 2 has no power. |

### Per 10/100Base TX port

| LED | Color | Function |
|-----|-------|----------|
| Link/ACT | Green | **Lit**: indicates the port is successfully connecting to the network at 100 Mbps. **Blinking**: indicates that the port is actively sending or receiving data. |

### Per 100Base-FX port

| LED | Color | Function |
|-----|-------|----------|
| Link/ACT | Green | **Lit**: indicates the port is successfully connecting to the network at 10 or 100 Mbps. **Blinking**: indicates that the port is actively sending or receiving data. |

### PoE port

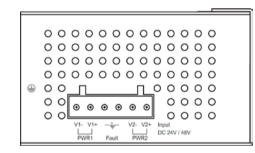| LED | Color | Function |
|-----|-------|----------|
| PoE in Use | Orange | **Lit**: indicates the port is providing 48 VDC in-line power (ports 1-4). |

## Switch upper panel

The upper panel of the industrial fast Ethernet switch consists of one terminal block connector within two DC power inputs.

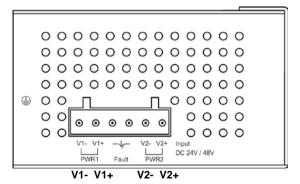Figure 2 below shows the upper panel of the industrial fast Ethernet switch.

**Figure 2: Industrial fast Ethernet switch upper panel**



### Wiring the power inputs

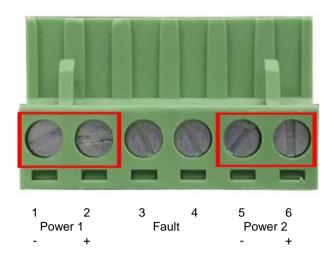The six-contact terminal block connector on the top panel of industrial fast Ethernet switch is used for two DC redundant power inputs. Follow the steps below to insert the power wire.

1. Insert positive and negative DC power wires into contacts 1 and 2 for Power 1 or 5, and 6 for Power 2.



**V1-  V1+          V2-  V2+**

2. Tighten the wire-clamp screws for preventing the wires from loosening.

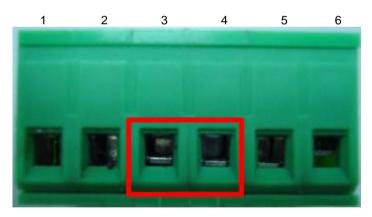|  1  |  2  |  3  |  4  |  5  |  6  |
|-----|-----|-----|-----|-----|-----|
| Power 1 |  | Fault |  | Power 2 |  |
| - | + |  |  | - | + |

**Note**:

1. The wire gauge for the terminal block should be in the range between 12 and 24 AWG.

2. The device must be grounded.

3. The DC power input range is 12 to 48 VDC.

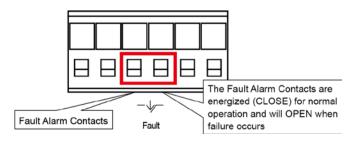## Wiring the fault alarm contact

The fault alarm contacts are in the middle of the terminal block connector. Upon inserting the wires, the industrial fast Ethernet switch detects the fault status of the power failure and then forms an open circuit. The following illustration shows an application example for wiring the fault alarm contacts.



Insert the wires into the fault alarm contacts.

**Note**:

1. The wire gauge for the terminal block should be in the range between 12 to 24 AWG.

2. Alarm relay circuit accepts up to 30 V, max. 3 A currents.



Fault Alarm Contacts

Fault

The Fault Alarm Contacts are energized (CLOSE) for normal operation and will OPEN when failure occurs
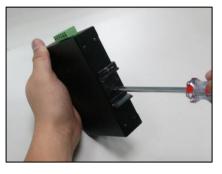
## Mounting

**Note:** Ensure that the industrial fast Ethernet switch is mounted vertically with the power connectors on the top and a minimum of three inches above and below the switch to allow for proper air flow. This device uses a convection flow of hot air which rises and brings cold air in from the bottom and out of the top of the device. Do not mount the switch horizontally as this does not allow air to flow up into the device and will result in damage to the switch. Do not tie DC1 to DC2. DC2 is for secondary power redundancy. Do not plug DC power into the device while the AC power cord is plugged in. This is not a hot-swappable switch. Hot-swapping this device will result in damage.

### DIN-rail mounting installation

To replace the wall-mount application with DIN-rail application on the industrial fast Ethernet switch, refer to the following figures to screw the DIN-rail on the industrial fast Ethernet switch.

To hang the industrial fast Ethernet switch, follow the steps below:

1. Screw the DIN-rail on the industrial fast Ethernet switch.



2. Place the bottom of DIN-rail lightly into the track.



3. Ensure that the DIN-rail is secured to the track.

To remove the industrial fast Ethernet switch from the track, carefully pull out the bottom of the DIN-rail to remove it from the track.



## Wall-mount plate mounting

To install the industrial fast Ethernet switch on the wall, follow the steps below.

1. Remove the DIN-rail from the industrial fast Ethernet switch. Loosen the screws to remove the DIN-rail.

2. Place the wall-mount plate on the rear panel of the industrial fast Ethernet switch.



3. Use the screws to screw the wall-mount plate on the industrial fast Ethernet switch.

4. Use the hook holes at the corners of the wall-mount plate to hang the industrial fast Ethernet switch on the wall.

5. To remove the wall-mount plate, reverse the steps above.

## Installation Steps

1. Unpack the industrial fast Ethernet switch.

2. Check the DIN-Rail that is pre-installed on the industrial fast Ethernet switch. (Please refer to DIN-Rail Mounting section for DIN-Rail installation. If you want to wall mount the industrial fast Ethernet switch, then please refer to Wall Mount Plate Mounting section for specific instructions.

3. To hang the industrial fast Ethernet switch on the DIN-Rail track or wall, please refer to the Mounting section.

4. Power on the industrial fast Ethernet switch. (Please refer to the Wiring the Power Inputs section for power input) The power LED on the industrial fast Ethernet switch illuminates. Please refer to the LED indicators section for LED definitions.

5. Prepare the twisted-pair, straight through Category 5 cable for Ethernet connection.

6. Insert one side of Category 5 cables into the industrial fast Ethernet switch Ethernet port (RJ-45 port) and the other side to the network device Ethernet port (RJ-45 port), ex: Switch, PC, or Server. The UTP port (RJ-45) LED on the industrial fast Ethernet switch illuminates when the cable is connected to the network device. Please refer to the LED indicators section for LED definitions.

7. Insert the fiber cable from the MC251-4P/1S to the fiber network. TX, RX must be paired at both ends. The optical port LED on the MC251-4P/1S illuminates when the connection is established with a network device. Please refer to the LED indicators section for LED definitions.

8. When all connections are set up and the LEDs illuminate, the installation is complete.

# Switch Operation

### Address Table

The industrial fast Ethernet switch is implemented with an address table. This address table is composed of many entries. Each entry is used to store the address information of each node in the network, including the MAC address, Port No., etc. This information comes from the learning process of the industrial fast Ethernet switch.

### Learning

When one packet comes from any port of the Industrial Fast Ethernet switch, the switch will record the source address, port no., and other related information in the address table. This information will be used to decide either forwarding or filtering for future packets.

### Forwarding & Filtering

When one packet comes from another port of the industrial fast Ethernet switch, it will also check the destination address besides the source address learning. The industrial fast Ethernet switch will lookup the address-table for the destination address. If not found, this packet will be forwarded to all the other ports except the port which this packet came in. These ports transmit this packet to the network it's connected to. If found, and the destination address is located at a different port from this packet comes in, the industrial fast Ethernet switch will forward this packet to the port where this destination address is located according to the information from address table. If the destination address is located at the same port when this packet comes in, then this packet will be filtered.

**Store-and-Forward**

Store-and-Forward is one type of packet-forwarding technique. A Store-and-Forward industrial switch stores the incoming frames in an internal buffer and checks for any errors from the frames before transmission. Lack of error packet occurrence is important for an efficient and stable network.

The industrial fast Ethernet switch scans the destination address from the packet-header, searches the routing table provided for the incoming port and forwards the packet, only if required. The fast forwarding makes the switch attractive for connecting servers directly to the network, thereby increasing throughput and availability. However, the switch is most commonly used to segment existing hubs, which nearly always improves overall performance. Ethernet Switching can be easily configured in any Ethernet network environment to significantly boost bandwidth using conventional cabling and adapters.

Due to the learning function of the industrial fast Ethernet switch, the source address and corresponding port number of each incoming and outgoing packet are stored in a routing table. This information is subsequently used to filter packets whose destination address is on the same segment as the source address. This confines network traffic to its respective domain, reducing the overall load on the network.

The industrial fast Ethernet switch performs "Store-and-Forward," therefore no error packets occur. More reliably, it reduces the re-transmission rate. No packet loss will occur.

**Auto-negotiation**

The TP ports on the industrial fast Ethernet switch have built-in "Auto-negotiation." This technology automatically sets the best possible bandwidth when a connection is established with another network device (usually at Power On or Reset). This is done by detecting the modes and speeds at the moment both devices are connected.

# Troubleshooting

This section contains issue-solving information. If the industrial fast Ethernet switch is not functioning properly, ensure that the industrial fast Ethernet switch was set up according to instructions in this manual.

| Issue | Solution |
|---|---|
| **The per port LED does not illuminate.** | *Check the cable connection and try swapping out a cable.* |
| **Performance is poor** | *Check the speed duplex mode of the partner device. The industrial fast Ethernet switch is run in auto-negotiation mode and if the partner is set to half duplex, then the performance will be poor.* |
| **The per port LED illuminates, but the traffic is irregular.** | *Ensure that the attached device is not set to dedicated full duplex. Some devices use a physical or software switch to change duplex modes. Auto-negotiation may not recognize this type of full-duplex setting.* |
| **The industrial fast Ethernet switch doesn't connect to the network** | *Check the per port LED and/or try another port on the industrial fast Ethernet switch. Ensure that the cable is installed properly and is the correct type. Turn off the power and then, after a while, turn on the power again.* |

# Product specifications

## MC251-4P/1S

| Hardware specifications | |
|---|---|
| 10/100BASE-TX Ports | 5 |
| 100Base-FX interface | N/A |
| IEEE 802.3af PoE ports | 4 |
| Dimensions (W × D × H) | 135 × 87.8 × 56 mm |
| Weight | 842 g |
| Power requirements | 12 to 48 VDC |
| Installation | DIN rail kit and wall-mount ear |
| **Power over Ethernet** | |
| PoE Standard | IEEE 802.3af Power over Ethernet / PSE |
| PoE Power Supply Type | End-Span |
| PoE Power Output | 48 VDC Per Port, 350 mA . Max. 15.4 W |
| Power Pin Assignment | 1/2(+), 3/6(-) |
| **Switch specifications** | |
| Switch processing scheme | Store-and-Forward |
| Address table | 2K |
| Flow control | Back pressure for half duplex<br>IEEE 802.3x pause frame for full duplex |
| Switch fabric | 1 Gbps |
| Throughput (packet per second) | 0.74 Mpps |
| Network cables | 10/100Base-TX:<br>Cat. 3, 4, 5, 5e, 6 UTP cable (100 m, max.)<br>EIA/TIA-568 100-ohm STP (100 m, max.) |
| **Standards conformance** | |
| Standards Compliance | IEEE 802.3 Ethernet<br>IEEE 802.3u Fast Ethernet<br>IEEE 802.3ab Gigabit Ethernet<br>IEEE 802.3x Full-Duplex Flow Control |
| Temperature | Operating: -40 to +75°C<br>Storage: -40 to 75°C |
| Humidity | Operating: 5% to 90%, Storage: 5% to 90% (non-condensing) |
| Regulatory compliance | FCC Part 15 Class A, CE |
| Stability testing | IEC60068-2-32 (Free Fall)<br>IEC60068-2-27 (Shock)<br>IEC60068-2-6 (Vibration) |

## NS2051-4P/1T

**Hardware specifications**

| 10/100BASE-TX Ports | 4 |
|---|---|
| 100Base-FX interface | 1 |
| IEEE 802.3af PoE ports | 4 |
| Dimensions (W × D × H) | 135 × 87.8 × 56 mm |
| Weight | 842 g |
| Power requirements | 12 to 48 VDC |
| Installation | DIN rail kit and wall-mount ear |

**Power over Ethernet**

| PoE Standard | IEEE 802.3af Power over Ethernet / PSE |
|---|---|
| PoE Power Supply Type | End-Span |
| PoE Power Output | 48 VDC Per Port, 350 mA . Max. 15.4 W |
| Power Pin Assignment | 1/2(+), 3/6(-) |

**Switch specifications**

| Switch processing scheme | Store-and-Forward |
|---|---|
| Address table | 2K |
| Flow control | Back pressure for half duplex IEEE 802.3x pause frame for full duplex |
| Switch fabric | 1 Gbps |
| Throughput (packet per second) | 0.74 Mpps |
| Network cables | 10/100Base-TX: Cat. 3, 4, 5, 5e, 6 UTP cable (100 m, max.) EIA/TIA-568 100-ohm STP (100 m, max.) |

**Standards conformance**

| Standards Compliance | IEEE 802.3 Ethernet IEEE 802.3u Fast Ethernet IEEE 802.3ab Gigabit Ethernet IEEE 802.3x Full-Duplex Flow Control |
|---|---|
| Temperature | Operating: -40 to +75°C Storage: -40 to 75°C |
| Humidity | Operating: 5% to 90%, Storage: 5% to 90% (non-condensing) |
| Regulatory compliance | FCC Part 15 Class A, CE |
| Stability testing | IEC60068-2-32 (Free Fall) IEC60068-2-27 (Shock) IEC60068-2-6 (Vibration) |

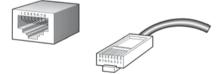# Appendix: Networking connection

## RJ45 pin assignments

**1000Mbps, 1000BASE-T**

| Contact | MDI | MDI-X |
|---|---|---|
| 1 | BI_DA+ | BI_DB+ |
| 2 | 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-TX**

| Contact | MDI Media Dependent Interface | MDI-X Media Dependent Interface -Cross |
|---|---|---|
| 1 | Tx + (transmit) | Rx + (receive) |
| 2 | Tx - (transmit) | Rx - (receive) |
| 3 | Rx + (receive) | Tx + (transmit) |
| 4, 5 | Not used | |
| 6 | Rx - (receive) | Tx - (transmit) |
| 7, 8 | Not used | |

## RJ45 cable pin assignments



**The standard RJ45 receptacle/connector**

There are eight wires on a standard UTP/STP cable and each wire is color-coded. Figure 3 on page 7 shows the pin allocation and color of straight-through cable and crossover cable connection:

**Figure 3: Straight-through and crossover cable**



| | SIDE 1 | SIDE 2 |
|---|---|---|
| | 1 = White / Orange | 1 = White / Orange |
| | 2 = Orange | 2 = Orange |
| | 3 = White / Green | 3 = White / Green |
| | 4 = Blue | 4 = Blue |
| | 5 = White / Blue | 5 = White / Blue |
| | 6 = Green | 6 = Green |
| | 7 = White / Brown | 7 = White / Brown |
| | 8 = Brown | 8 = Brown |

| | SIDE 1 | SIDE 2 |
|---|---|---|
| | 1 = White / Orange | 1 = White / Green |
| | 2 = Orange | 2 = Green |
| | 3 = White / Green | 3 = White / Orange |
| | 4 = Blue | 4 = Blue |
| | 5 = White / Blue | 5 = White / Blue |
| | 6 = Green | 6 = Orange |
| | 7 = White / Brown | 7 = White / Brown |
| | 8 = Brown | 8 = Brown |

Ensure that the connected cables have the same pin assignment and color as described above.

## Regulatory information

| | |
|---|---|
| Manufacturer | Interlogix. 2955 Red Hill Avenue, Costa Mesa, CA 92626 5923, USA |
| | Authorized EU manufacturing representative: UTC Fire & Security B.V. Kelvinstraat 7, 6003 DH Weert, The Netherlands |
| FCC compliance | Class A: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. |
| FCC conditions | This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference. (2) This Device must accept any interference received, including interference that may cause undesired operation. |
| ACMA compliance | Notice! This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. |
| Canada | This Class A digital apparatus complies with CAN ICES-003 (A)/NMB-3 (A). Cet appareil numérique de la classe A est conforme à la norme CAN ICES-003 (A)/NMB-3 (A). |

| Certification | CE ⟨⟨Ⓒ⟩⟩ |
|---|---|
| European Union directives | This product complies with the applicable harmonized European standards listed under the EMC Directive 2014/30/EU, the RoHS Directive 2011/65/EU. |
| | 2012/19/EU (WEEE directive): Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points. For more information see: www.recyclethis.info. |
| Trademarks and patents | The trade names used in this document may be trademarks or registered trademarks of the manufacturers or vendors of the respective products. |

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