



# **NI MES-3980**

## **Hardware Installation Guide**

**First Edition, Sept 2007**

# Package Checklist

The NI MES-3980 is shipped with the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

- NI MES-3980 Switch
- Hardware Installation Guide
- CD-ROM with User's Manual and Windows Utility
- RJ45 to DB9 Console port cable
- Protective caps for unused ports

## Features

### ➤ **Advanced Industrial Networking Capability**

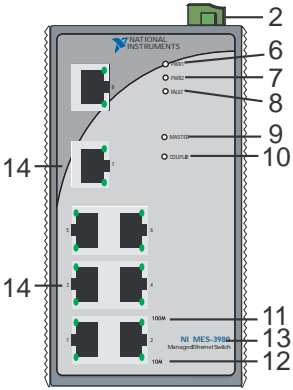
- Plug-n-Play, Redundant Ethernet Ring (recovery time < 300 ms at full load) and RSTP/STP (IEEE802.1W/D)
- IGMP Snooping and GMRP for filtering multicast traffic from Industrial Ethernet
- Supports port-based VLAN, IEEE802.1Q VLAN and GVRP protocol to ease network planning
- Supports QoS-IEEE802.1p/1Q and TOS/DiffServ to increase determinism
- Supports 802.3ad, LACP for optimum bandwidth utilization
- Port Trunking for optimum bandwidth utilization
- RMON for efficient network monitoring and proactive capability
- SNMP V1/V2c/V3 for different levels of network management security
- Supports IEEE802.1X and https/SSL to enhance network security

### ➤ **Designed for Industrial Applications**

- Bandwidth management to prevent unpredictable network operation
- Port mirroring for online debugging
- Lock port for authorized MAC address access
- Digital inputs to integrate sensors and alarms with IP networks
- Automatic warning by exception through email, relay output
- Automatic recovery of IP addresses from connected devices
- Line-swap fast recovery (patent pending)
- Redundant, dual DC power inputs
- -40 to 75°C operating temperature range
- IP30, rugged high-strength case
- DIN-Rail or panel mounting ability

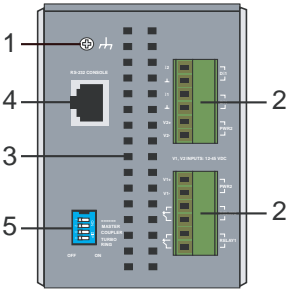
# Panel Layout

## Front Panel View

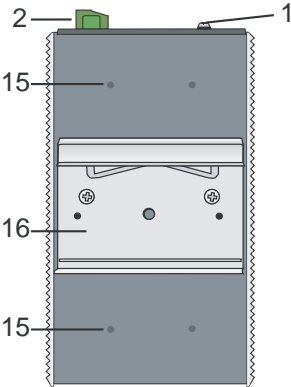


1. Grounding screw
2. Terminal block for power input PWR1/PWR2 and relay output
3. Heat dissipation orifices
4. Console port
5. DIP switches
6. Power input PWR1 LED
7. Power input PWR2 LED
8. Fault LED
9. Master LED
10. Coupler LED
11. TP port's 100 Mbps LED
12. TP port's 10 Mbps LED
13. Model Name
14. 10/100BaseT(X) ports
15. Screw hole for wall mounting kit
16. DIN-Rail kit

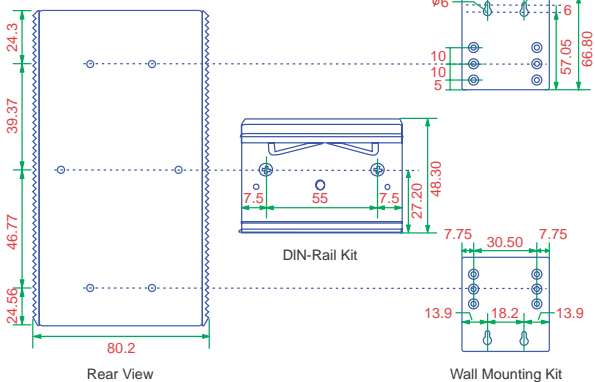
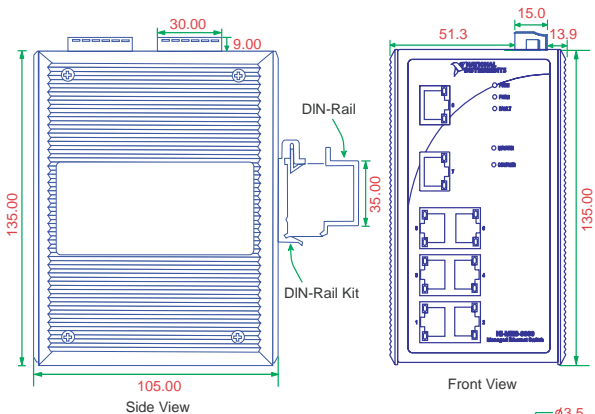
## Top Panel View



## Rear Panel View



# Mounting Dimensions (unit = mm)

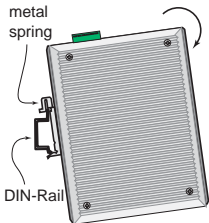


## DIN-Rail Mounting

The aluminum DIN-Rail attachment plate should already be fixed to the back panel of the NI MES-3980 when you take it out of the box. If you need to reattach the DIN-Rail attachment plate, make sure the stiff metal spring is situated towards the top, as shown in the following figure.

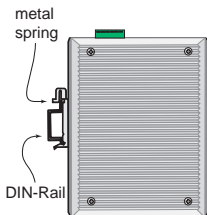
### STEP 1:

Insert the top of the DIN-Rail into the slot just below the stiff metal spring.



### STEP 2:

The DIN-Rail attachment unit will snap into place as shown.

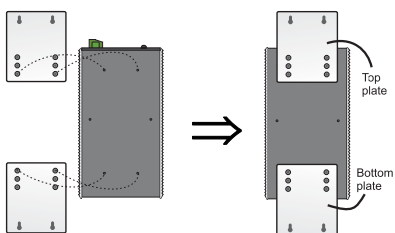


To remove the NI MES-3980 from the DIN-Rail, simply reverse Steps 1 and 2.

## Wall Mounting (optional)

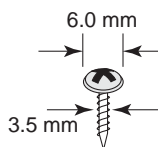
For some applications, you will find it convenient to mount the NI MES-3980 on the wall, as shown in the following figures.

**STEP 1:** Remove the aluminum DIN-Rail attachment plate from the NI MES-3980's rear panel, and then attach the wall mount plates, as shown in the figures at the right.



### STEP 2:

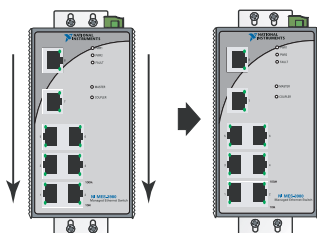
Mounting the NI MES-3980 on the wall requires 4 screws. Use the NI MES-3980, with wall mount plates attached, as a guide to mark the correct locations of the 4 screws. The heads of the screws should be less than 6.0 mm in diameter, and the shafts should be less than 3.5 mm in diameter, as shown in the figure at the right.



**NOTE** Before tightening the screws into the wall, make sure the screw head and shank size are suitable by inserting the screw into one of the keyhole-shaped apertures of the Wall Mounting Plates.

Do not screw the screws in completely—leave about 2 mm to allow room for sliding the wall mount panel between the wall and the screws.

**STEP 3:** Once the screws are fixed in the wall, insert the four screw heads through the large parts of the keyhole-shaped apertures, and then slide the NI MES-3980 downwards, as indicated. Tighten the four screws for added stability.



## Wiring Requirements



### WARNING

The power for this product is intended to be supplied by a Listed Power Unit, with output marked LPS, and rated to deliver 12 to 45 VDC at a maximum of 600 mA.



### WARNING

#### **Safety First!**

Be sure to disconnect the power cord before installing and/or wiring your NI MES-3980. Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

You should pay attention to the following important points:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.
- NOTE: Do not run signal or communications wiring, and power wiring through the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- Use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separate.
- It is strongly advised that you label wiring to all devices in the system, when necessary.

## Grounding the Switch

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.

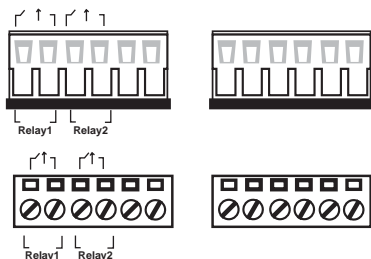


### ATTENTION

This product is intended to be mounted to a well-grounded mounting surface, such as a metal panel.

## Wiring the Relay Contact

The NI MES-3980 has two sets of relay output—relay 1 and relay 2. Each relay contact consists of two contacts of the terminal block on the NI MES-3980's top panel. Refer to the next section for detailed instructions on how to connect the wires to the terminal block connector, and how to attach the terminal block connector to the terminal block receptor. The meaning of the two contacts used to connect the relay contacts is illustrated below.



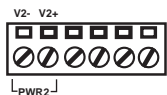
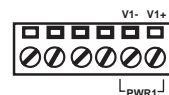
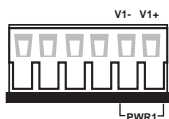
The fault circuit will open if:

1. A relay warning event is triggered, OR
2. The NI MES-3980 is the Master of this Turbo Ring, and the Turbo Ring is broken, OR
3. Start-up failure.

If none of these three conditions is met, the fault circuit will remain closed.

## Wiring the Redundant Power Inputs

The NI MES-3980 unit has two sets of power inputs—power input 1 and power input 2. The top two contacts and the bottom two contacts of the 6-pin terminal block connector on the top panel are used for the NI MES-3980's two digital inputs. Top and front views of one of the terminal block connectors are shown below.



Take the following steps to wire the redundant power inputs:

**STEP 1:** Insert the negative/positive DC wires into the V-/V+ terminals.

**STEP 2:** To keep the DC wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

**STEP 3:** Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on the NI MES-3980's top panel.

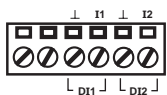
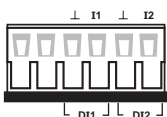


## ATTENTION

Before connecting the NI MES-3980 to the DC power inputs, make sure the DC power source voltage is stable.

## Wiring the Digital Inputs

The NI MES-3980 unit has two sets of digital inputs, DI 1 and DI 2. Each DI consists of two contacts of the 6-pin terminal block connector on the NI MES-3980's top panel. The remaining contacts are used for the NI MES-3980's two DC inputs. Top and front views of one of the terminal block connectors are shown below.



Take the following steps to wire the digital inputs:

**STEP 1:** Insert the negative (ground)/positive DI wires into the  $\perp$ /I1 terminals.

**STEP 2:** To keep the DI wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

**STEP 3:** Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on the NI MES-3980's top panel.

# 10/100BaseT(X) Ethernet Port Connection

The 10/100BaseT(X) ports located on NI MES-3980's front panel are used to connect to Ethernet-enabled devices.

Next, we show pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports, and also show cable wiring diagrams for straight-through and cross-over Ethernet cables.

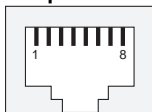
## MDI Port Pinouts

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-

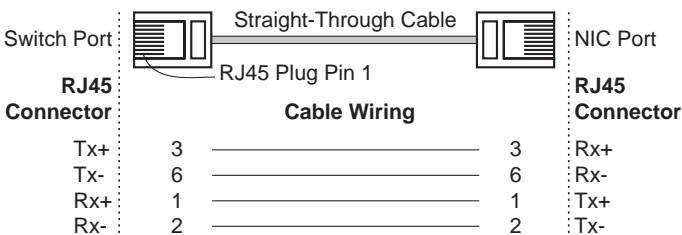
## MDI-X Port Pinouts

Pin	Signal
1	Rx+
2	Rx-
3	Tx+
6	Tx-

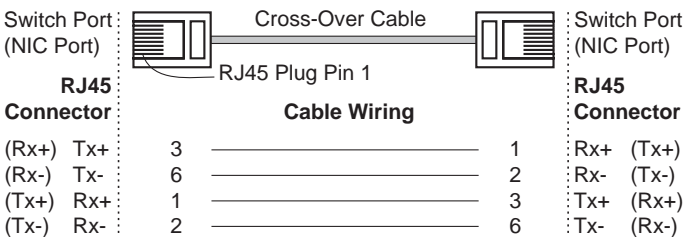
## 8-pin RJ45



## RJ45 (8-pin) to RJ45 (8-pin) Straight-Through Cable Wiring



## RJ45 (8-pin) to RJ45 (8-pin) Cross-Over Cable Wiring



# Relay Contact

The NI MES-3980 has two relay contacts located on the top panel. For detailed instructions on how to connect the relay contact power wires to the two middle contacts of the 6-contact terminal block connector, see the **Wiring the Relay Contact** section. A typical scenario would be to connect the fault circuit to a warning light located in the control room. The light can be set up to switch on when a fault is detected.

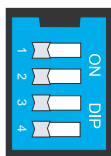
The Relay Contact has two terminals that form a fault circuit for connecting to an alarm system. The two wires attached to the fault contacts form an open circuit when (1) a relay warning event is triggered, (2) the NI MES-3980 is the Master of this Turbo Ring, and the Turbo Ring is broken, or (3) start-up failure. If none of these three conditions occur, the fault circuit will be closed.

# Turbo Ring DIP Switch Settings

The NI MES-3980 switches are plug-and-play managed redundant Ethernet switches. The proprietary Turbo Ring protocol was developed by NI to provide better network reliability and faster recovery time. The recovery time of the NI Turbo Ring is less than 300 ms-compared to a 3- to 5-minute recovery time for commercial switches, decreasing the possible loss caused by network failures in an industrial setting. There are 4 Hardware DIP Switches for Turbo Ring on the top panel of the NI MES-3980 that can be used to set up the Turbo Ring easily within seconds.

**NOTE** If you do not want to use a hardware DIP switch to set up the Turbo Ring, you can use a web browser, Telnet, or console to disable this function.

## NE MES-3980 DIP Switches



-----  
MASTER  
COUPLER  
TURBO  
RING

The default setting for each DIP Switch is OFF. The following table explains the effect of setting the DIP Switches to the ON positions.

DIP Switch	Setting	Description
-----		Serves no function (reserved for future use)
MASTER	On	Enables the NI MES-3980 to be the Ring Master in a Turbo Ring topology, and enables the Turbo Ring break warning. If the NI MES-3980 is the Master of this Turbo Ring, and the Turbo Ring is broken, the relay will form an open circuit.
	Off	Disables the NI MES-3980 from being the Ring Master in a Turbo Ring topology, and disables the Turbo Ring break warning.
COUPLER	On	Enables the Turbo Ring Coupling function. Use ports 5 and 6 of NI MES-3980 to form the Ring Coupler path.
	Off	Disables the Turbo Ring coupling function.
TURBO RING	On	Enables plug-and-play Turbo Ring redundancy. Ports 7 and 8 of the NI MES-3980 are used to form a Turbo Ring.
	Off	Disables the plug-and-play Turbo Ring redundancy function.

**NOTE** You must enable the Turbo Ring function first before using the DIP switch to activate the Master and Coupler functions.

**NOTE** If you do not enable any of the NI MES-3980 switches to be the Ring Master, the Turbo Ring protocol will automatically choose the NI MES-3980 with the smallest MAC address range to be the Ring Master. If you accidentally enable more than one NI MES-3980 to be the Ring Master, the NI MES-3980 switches will auto-negotiate to determine which one will be the Ring Master.

## LED Indicators

The front panel of the NI MES-3980 contains several LED indicators. The function of each LED is described in the following table.

LED	Color	State	Description
<b>PWR1</b>	AMBER	On	Power is being supplied to power input PWR1
		Off	Power is not being supplied to power input PWR1
<b>PWR2</b>	AMBER	On	Power is being supplied to power input PWR2
		Off	Power is not being supplied to power input PWR2
<b>FAULT</b>	RED	On	When (1) a relay warning event is triggered, (2) the NI MES-3980 is the Master of this Turbo Ring, and the Turbo Ring is broken, or (3) start-up failure
		Off	When a relay warning event is not triggered
<b>MASTER</b>	GREEN	On	When the NI MES-3980 is the Master of this Turbo Ring
		Blinking	When the NI MES-3980 is the Ring Master of this Turbo Ring and the Turbo Ring gets disconnected
		Off	When the NI MES-3980 is not the Master of this Turbo Ring
<b>COUPLER</b>	GREEN	On	When the NI MES-3980 enables the coupling function to form a backup path
		Off	When the NI MES-3980 is not the Ring Coupler of this Turbo Ring
<b>10M</b>	GREEN	On	TP port's 10 Mbps link is active
		Blinking	Data is being transmitted at 10 Mbps
		Off	TP Port's 10 Mbps link is inactive
<b>100M</b>	GREEN	On	TP port's 100 Mbps link is active
		Blinking	Data is being transmitted at 100 Mbps
		Off	TP Port's 100 Mbps link is inactive

# Auto MDI/MDI-X Connection

The Auto MDI/MDI-X function allows users to connect the NI MES-3980's 10/100BaseTX ports to any kind of Ethernet device, without needing to pay attention to the type of Ethernet cable being used for the connection. This means that you can use either a *straight-through* cable or *cross-over* cable to connect the NI MES-3980 to Ethernet devices.

## Specifications

### Technology

Standards	IEEE802.3, 802.3u, 802.3x, 802.1D, 802.1w, 802.1Q, 802.1p, 802.1X, 802.3ad
Protocols	IGMP V1/V2/V3 device, GVRP, GMRP, SNMP V1/V2c/V3, DHCP Server/Client, BootP, RMON, TFTP, SNTP, SMTP, RARP
MIB	MIB-II, Ethernet-Like MIB, P-BRIDGE MIB, Q-BRIDGE MIB, Bridge MIB, RSTP MIB, RMON MIB Group 1,2,3,9
Forwarding and Filtering Rate	148810 pps
Processing Type	Store and Forward
Flow Control	IEEE802.3x flow control, back pressure flow control

### Interface

RJ45 Ports	10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
Console	RS-232 (RJ45)
LED Indicators	PWR1, PWR2, FAULT, 10M, 100M, MASTER and COUPLER
Relay Contact	Two relay outputs with current carrying capacity of 1A @ 24 VDC
DIP Switches	Master, Coupler, Turbo Ring, Reserve
Digital Input	Two inputs with the same ground, but electrically isolated from the electronics <ul style="list-style-type: none"><li>• For state "1": +13 to +30V</li><li>• For state "0": -30 to +3V</li><li>• Max. input current: 8 mA</li></ul>

### Power

Input Voltage	12 to 45 VDC, redundant inputs
Input Current (@24V)	Max. 0.29A
Connection	Two removable 6-pin terminal blocks
Overload Current Protection	Present
Reverse Polarity Protection	Present

### Mechanical

Casing	IP30 protection, metal case
Dimensions	80.5 × 135 × 105 mm (W × H × D)
Weight	1.04 kg

Installation	DIN-Rail, Wall Mounting (optional kit)
<b>Environment</b>	
Operating Temperature	-40 to 75°C (-40 to 167°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Ambient Relative Humidity	5 to 95% (non-condensing)
<b>Regulatory Approvals</b>	
Safety	UL60950-1, CSA C22.2 No. 60950-1, EN60950-1, TÜV
Hazardous Location	UL/cUL Class I, Division 2, Groups A, B, C, and D
EMI	FCC Part 15, CISPR (EN55022) class A
EMS	EN61000-4-2 (ESD), Level 2 EN61000-4-3 (RS), Level 3 EN61000-4-4 (EFT), Level 3 EN61000-4-5 (Surge), Level 3 EN61000-4-6 (CS), Level 3 EN61000-4-8 EN61000-4-11 EN61000-4-12
Operating Shock	15 g, half-sine, 11 ms pulse
Operating Vibration	10 Hz to 150 Hz, 1 rms

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