

rdcEnetFO USERS MANUAL

ETHERNET TO MULTIMODE FIBER-OPTICS CONVERTER
 ETHERNET TO SINGLEMODE FIBER-OPTICS CONVERTER
 ETHERNET TO WDM FIBER-OPTICS CONVERTER

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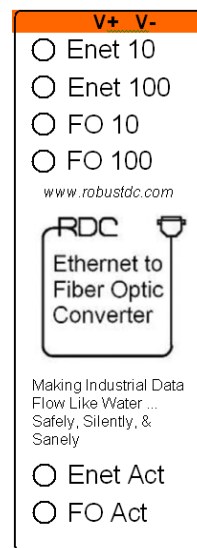
1. INTRODUCTION

The rdcEnetFO is an industrial-grade Ethernet to fiber optic converter. It extends the distance limit of Ethernet-based networks by converting the Ethernet signals to optical signals. Furthermore, the increased distance via fiber optic cables also brings about another advantage : EMI immunity. The rdcEnetFO will work with most combinations of singlemode and multimode fibers; and with a supply in the range of 9 to 48 Vdc.

1.1. Product Overview

The rdcEnetFO is designed specifically for use in industrial panel applications. It provides the following unique combination of features:

- Auto-negotiation selects the best duplex mode and highest possible link speed.
- Fiber optics provides an intrinsically 100% galvanically isolated, noise-free, lightning immune data communications signal. The rdcEnetFO is capable of communicating up to 2 km on multimode and 40 km on singlemode.
- WDM option allows the use of a single cable for full-duplex communication up to 20 km.
- The built-in transformer isolation in the Ethernet port provides another 1500 Vrms of isolation to the internal circuitry.
- For rapid troubleshooting, there are LED indicators for data transmission (FO Act and Enet Act) and link speed indicators (FO 100, FO 10, Enet 100, Enet 10)
- Wide power supply range (9 to 48 Vdc) allows use with 9 V, 12V, 24V, 48V supplies or direct from 12 V or 24 V battery systems. For 110 Vac or 230 Vac operation, any common 9 or 12 Vdc wall transformer can be used.



1.2. User Interface

The rdcEnetFO is designed for user-friendly application. The Yellow LEDs **FO Act** and **Enet Act** blinks when any data is received on the Optical and Ethernet ports respectively. Link speed indicators **FO 100**, **FO 10**, **Enet 100**, **Enet 10** indicate the negotiate speed at both ports.

2. Ethernet

Most modern network hubs or switches support MDI/MDI-X. The rdcEnetFO will generally work with either a straight or crossover cable.

2.1 Ethernet cabling specifications

This section describes guidelines for using 10/100BaseT twisted-pair cabling:

- ❑ Recommended cable is 22 to 26 AWG category 3 or category 5 unshielded solid copper twisted pair (standard telephone wire), at least Level 2 (two twists per foot).
- ❑ Maximum distance of a segment—from concentrator to node—is 100 meters (328 feet).
- ❑ Ethernet network interface cards (NICs) are available with built-in 10/100BaseT transceivers and a 15-pin AUI port.
- ❑ Devices with standard AUI ports may be attached by using a twisted-pair transceiver (MAU).

In the event that a predated hub or switch is used, then a crossover cable is required. All the necessary information for fabricating both types of cables is shown below and on the next page.

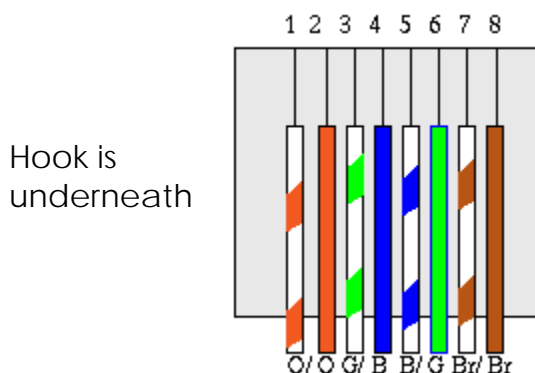


Figure 1 - Both ends of a straight cable

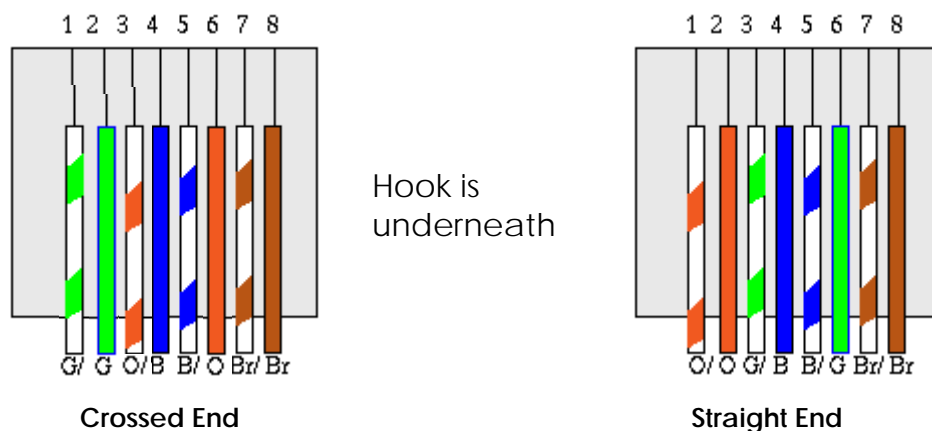


Figure 2 - Both ends of a crossover cable

The pinout are shown in the tables below.

Pin	Colour	Pair	Description
1	White Orange	2	TXDATA+
2	Orange	2	TXDATA-
3	White Green	3	RXDATA+
4	Blue	1	
5	White Blue	1	
6	Green	3	RXDATA-
7	White Brown	4	
8	Brown	4	

Table 1 - Pinout for both ends of Straight Cable

Pin	Colour	Pair	Description
1	White Green	2	TXDATA+
2	Green	2	TXDATA-
3	White Orange	3	RXDATA+
4	Blue	1	
5	White Blue	1	
6	Orange	3	RXDATA-
7	White Brown	4	
8	Brown	4	

Table 2 - Pinout for one end of a Crossover Cable

3. Typical Set Up

A typical setup is shown in Figure 3a below.

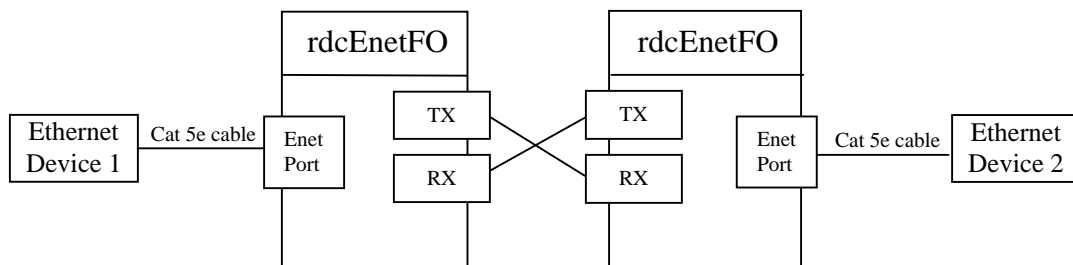


Figure 3a - Connection between both rdcEnetFO

For the WDM option, the connection is simpler as only one fiber optic cable is need, as shown in Figure 3b below.

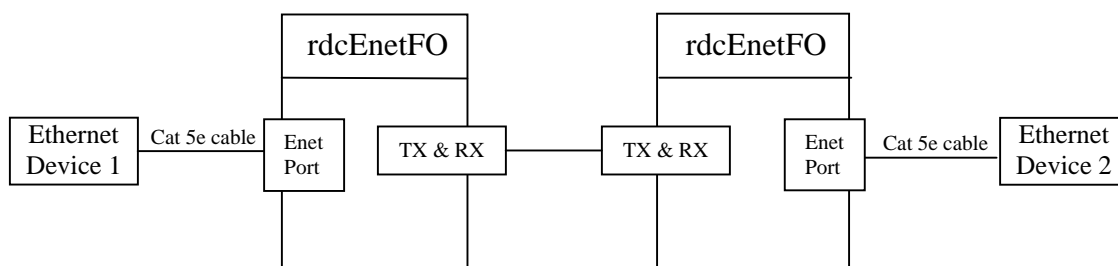


Figure 3b - Connection between both rdcEnetFO for WDM option

The rdcEnetFO will accept any voltage in the range of 9 to 48 Vdc. It is recommended that the rdcEnetFO be used in pairs.

4. Connection Scenarios

The rdcEnetFO does not support automatic switching of MDI/MDI-X. This means that the ethernet device that the rdcEnetFO is connected to, has to handle the "crossing" of the Ethernet cable where necessary. Sections 4.1 and 4.2 will describe the various connection scenarios.

4.1 Connection to Older Ethernet Devices (Especially Older Hubs)

Some of the older 10-BaseT hubs do not support auto MDI/MDI-X. They are configured as MDI. Since the rdcEnetFO is also configured as MDI, a cross cable is need. Refer to Fig 2 for the pinouts to fabricate a cross cable.

4.2 Connection to Newer Ethernet Devices

Most newer switches and hubs support auto MDI/MDI-X. Hence, either a straight or cross cable can be used.

4.3 Speed Settings

The rdcEnetFO is configured to auto-negotiate the best connection speed between the two ethernet devices.

The fiber link will not work if both ethernet devices are forced to run at different speeds.

Hence, it is recommended to enable the auto speed negotiation on both ethernet devices. If all else fails, force both ethernet devices to operate at 10 Mbps.

5. Troubleshooting

Fault	Action Required
Unit does not power on	<ul style="list-style-type: none"> • Check that the supply voltage is in the range of 9 to 48 Vdc. • Ensure that the supply wirings are not reversed and are correctly terminated.
No link between 2 units of rdcEnetFO	<ul style="list-style-type: none"> • Check that the ethernet devices at both ends are configured to run at the same speed or ensure that auto speed negotiation is enabled. • Check that the fiber connections are connected correctly. i.e. TX to RX etc.
Link utilization is poor	<ul style="list-style-type: none"> • Check if the hub or switch is causing a bottleneck.

6. TECHNICAL SPECIFICATION

6.1. Port Description

- 6.1.1. **Ethernet**; as per IEEE 802.3
- 6.1.2. **Fiber Optics**; 1300nm over 62.5/125, 100/140, or 50/125 μ m fibers on Multimode
 1310nm over 9/125 μ m fibers on Singlemode
 1310/1550 nm over 9/125 μ m fibers on WDM
- 6.1.3. **Fiber Distances (MAX)**; 2 km over multimode
 40 km over singlemode
 20 km over WDM
- 6.1.4. **Connectors**; ST,SC or FC for Single mode and Multimode, SC only for WDM
- 6.1.5. **Speed**; Auto-Negotiation, 10/100Base-TX; No configuration required

6.2. Isolation (Per ISO/IEC 9549)

- 6.2.1. **Fiber Optics Port**; Intrinsic full isolation
- 6.2.2. **Ethernet Port**; Built in transformer isolation (1500 Vrms)
- 6.2.3. **Casing**; dielectric strength per DIN VDE 0303/part 2 is 400kV/cm

6.3. Power Supply

- 6.3.1. **rdcEnetFO-gv**; unregulated 9 to 48 Vdc, 90 mA @ 24 Vdc, 100 Mbps

6.4. Environmental

- 6.4.1. **Ambient Operating Temp**; -40°C to +65°C
- 6.4.2. **Ambient Storage Temp**; -40°C to +100°C
- 6.4.3. **Relative Humidity**; 10-90%, non condensing
- 6.4.4. **Casing**; fungus and termite resistant
- 6.4.5. **Casing; flame characteristics**: self-extinguishing per UL 94 V2

6.5. Mechanical Dimensions

- 6.5.1. **Height; Width; Depth**
- 6.5.2. **Weight**; less than 120g.
- 6.5.3. **Terminal Capacity**
 2.5mm (12 AWG)
- 6.5.4. **Mounting Rail**;
 DIN EN 50022 (35mm sym)
 DIN EN 50025 (32mm asym)
*Note: removal from a
 DIN EN 50025 rail is difficult.*

