

# MDU Solutions® QFN FIBER NODE

## 1. Introduction

The QFN is an indoor fiber node based upon the successful QDAX family of amplifiers.

The QFN provides the user with either a one-way or two-way 870 MHz or 1 GHz node with high RF and optical performance. The forward optical detector will accept either 1310nm or 1550nm wavelengths. The QFN is designed to operate with optical input levels ranging from -4 dBm to +4 dBm. A nominal optical input level of 0 dBm provides best RF performance.

The QFN can also provide a 5 to 42 MHz return path option which is enabled when a return hybrid IC and laser assembly are installed onto the motherboard. Various optical return path options are offered, consisting of an FP based laser, a 1310nm and 1550nm and an ITU grid CWDM DFB based laser. The 1550nm DFB and CWDM ITU grid return path lasers can also be ordered with an integrated WDM (Wavelength Division Multiplexer) which allows both forward and return path communication on a single optical fiber.

Depending on which specific model is ordered, the QFN can provide RF output levels of +40 dBmV to +51 dBmV. For set-up and monitoring purposes, the QFN provides a -30 dB RF Test Point, a -20 dB Sweep Input Test Point and a -20 dB Test Point for Return Path RF input. Internally a 10-segment LCD Optical Power Meter is available to aid in proper set-up of the forward path optical input.



## 2. Installation

The QFN is designed as a wall or cabinet mounted device. Four mounting holes are available on the chassis to provide the installer the ability to secure the QFN in the required mounting method. The QFN is specified to operate from 0°C to +70°C (+32°F to +158°F). The QFN should be mounted in an adequately ventilated area to provide adequate air flow across the chassis and should not be installed in areas of high humidity. Extremely dusty areas should be avoided as well to eliminate potential contamination of the optical interfaces.

## 3. Powering

The QFN operates with an external class 2 transformer (model #951, 120 to 26 VAC, 60 Hz). Alternately an external Universal Power Supply (model EPS 267-ND, 100-240 VAC, 24 VDC) is available for requirements other than typical 110 VAC installations. AC powering is accomplished by connecting the terminals of the #951 transformer (or alternate EPS 267-ND Universal Power Supply) at the terminal block located on the underside of the QFN.

## 4. Optical Connectors & Cleaning

The QFN is available with either SC/APC (green) or SC/UPC (blue) style optical connectors. The optical connector is located on the rear of the unit. Be sure to only mate the same style connectors. Mating APC with UPC-style connectors can cause undesirable results. Fiber connectors should never be left uncovered due to the possibility of contamination. Commercially available fiber cleaning products are easily available (such as pre-packaged alcohol wipes, Kim-Wipes, etc.) and should be used to ensure that the fiber connections are free of any contaminants.

## 5. Operational Set-up

After attaching power and securely mounting the QFN, connect the forward optical input (labeled **FORWARD OPTICAL INPUT**) ensuring that the optical connectors are kept free of contaminants. If applicable, connect the return path optical connector (labeled **RETURN LASER**).

If installing a QFN Node with an integrated WDM for bidirectional communications, only the **FORWARD OPTICAL INPUT** connection will be utilized for both forward and return transmission.

Connect the forward RF output (labeled **FWD. OUTPUT**) using a 75 Ohm F-style connector.

The optical input range of the QFN is **-4 dBm to +4 dBm**. The recommended operating range of the QFN is **-2 dBm to +2 dBm**. Optimum performance of the QFN is specified with **1mW (0 dBm)** of optical input power to achieve the stated specifications. Optical inputs which are less than **-2 dBm** or above **+2 dBm** will result in slightly decreased RF performance of the QFN.

As shown in Figure 1 below, a 10-bar LED located inside the unit provides a quick indication of forward optical input power. When the LED lights **GREEN**, you are within the recommended operating range of the node (**-2 dBm to +2 dBm**) as shown in the figure below. When the LED lights either **YELLOW** or **RED** you are outside of the recommended operating range and should decrease or increase optical input power as needed until the LED displays **GREEN**.

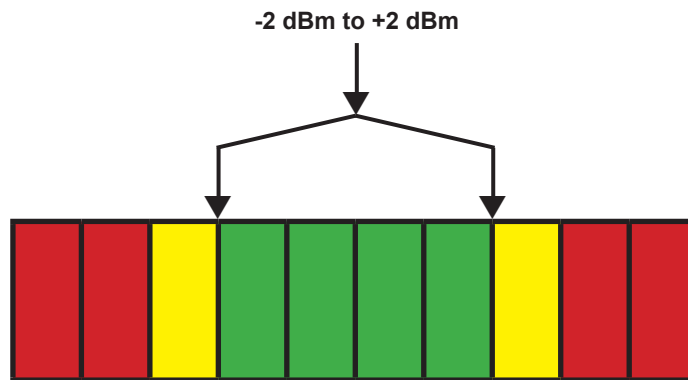


Figure #1: Forward Optical Input LED Bar Graph

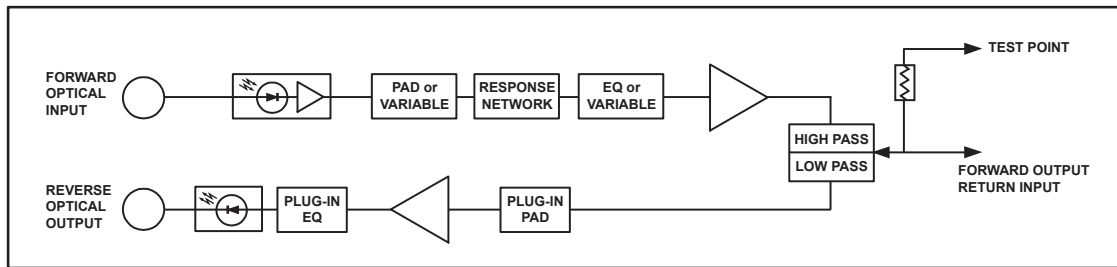
After connection of the forward and return optical connections into the QFN and verifying the correct optical input power, RF slope and gain adjustments can be made to help achieve the required output slope and output RF levels. Gain for both the forward and the return can be controlled by adjusting the values of the plug-in SXP-style attenuator pads on the motherboard. The appropriate locations are shown below on the logical schematic labeled **Figure 2**.

The forward path accommodates Interstage Equalization which can be controlled by adjusting the QAIE-style equalizer located on the motherboard and whose location is shown on the logical schematic in **Figure 2**.

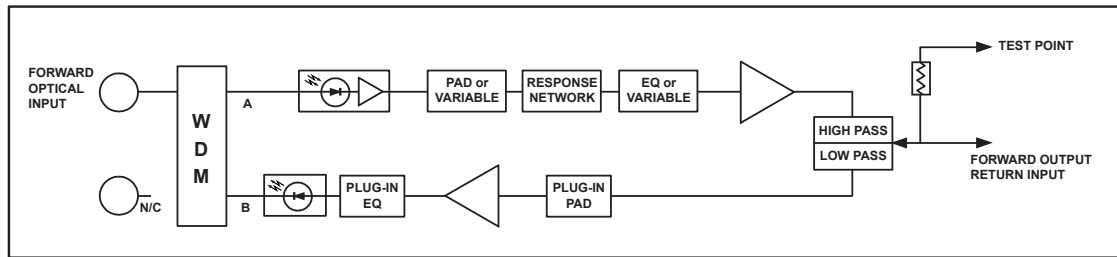
Utilize the -30 dB Test Point to measure the FWD path gain and slope.

The return path EQ can also be adjusted to provide optimal performance by changing the value of the plug-in QES 42-style return EQ.

A -20 dB Sweep Input Test Point, located inside the unit can also be utilized for setting up the return path. The -20 dB Sweep Input Test Point is shown below and is labeled accordingly on the motherboard of the unit.



**Figure #2:** QFN Functional Schematic



**Figure #3:** QFN with Integrated WDM Functional Schematic

SPECIFICATIONS	ONE-WAY	TWO-WAY				RETURN LASERS			
	QFN GP	QFN GP				1310nm DFB	1550nm DFB	1310nm FP	CWDM
BANDWIDTH (MHz)	5 - 870	54 - 870 or 1000				5 to 42	5 to 42	5 to 42	5 to 42
FREQ. RESPONSE	± 0.5 dB	± 0.5 dB				± 0.25 dB	± 0.25 dB	± 0.25 dB	± 0.25 dB
CHANNEL LOADING	77	77				4	4	1	4
GAIN CONT. RANGE	N/A	PAD				PAD	PAD	PAD	PAD
SLOPE CONT. RANGE	N/A	EQ				EQ	EQ	EQ	EQ
GAIN	N/A	N/A				23	23	23	23
OUTPUT LEVELS	48	40	44	49	51	2 mw	2 mw	1 mw	2 mw
DISTORTIONS	COMP. TR. BT. (-dB)	74	82	74	69	65	N/A	N/A	N/A
	COMP. 2nd ORD. (-dB)	73	77	73	71	67	> 65 <sup>(1)</sup>	> 65 <sup>(1)</sup>	Typ. 49 <sup>(1)</sup>
CARRIER TO NOISE (dB)	53	53	53	53	53	N/A	N/A	N/A	N/A
RETURN LOSS (Worst Case)	15 dB	15 dB	15 dB	15 dB	15 dB	15 dB	15 dB	15 dB	15 dB
DC AMPERES @ 24 VDC	0.66	0.66	0.66	0.66	0.66	0.18	0.18	0.18	0.18
POWER DISSIPATION (Watts) <sup>(2)</sup>	27	27	27	27	27	7	7	7	7

**NOTES:**  
 All forward node specifications are based on 1 mW (0dBm) optical power input with 3.7% OMI per channel.  
 (1) Return Laser specification is for discrete 2nd order beats, not composite 2nd order.  
 (2) Power dissipation is measured at 120 VAC. Multiple gain models show minimum specifications, call for exact data.

**Figure #4:** QFN Specifications

Part Number		Description
<b>Example Part Number:</b>		
<b>QFN 870 A -40 GP 2W</b> 1 2 3 4 5		
1. Frequency Range: 870 = 870 MHz 000 = 1000 MHz		
2. Connector Type: A = SC/APC F = SC/UPC		
3. Output Level (See Specifications Table)		
4. Technology: GP = GaAs Power Doubled		
5. 2-Way Ready*: 2W *		
1-Way: 1W		
<b>NOTE:</b> * To activate 2-way functionality, order one of the Return Laser options: QFRL/DFB1-23, QFRL/DFB15-23, QFRL/DFB15-23W, QFRL/FP1-23 or QFRL/xxxx-23.		
Part Number		Description
Options		
QFRL/DFB1-23	1310nm 2mW DFB Return Laser	
QFRL/DFB15-23	1550nm 2.5mW DFB Return Laser	
QFRL/DFB15-23W	1550nm 2.5mW DFB Return Laser; WDM Module Integrated into Unit	
QFRL/FP1-23	1310nm, 1mW Fabry-Perot Return Laser	
QFRL/xxxx-23	CWDM, 2mW, DFB. xxxx = 1470, 1490, 1510, 1530, 1570, 1590, 1610	
QPML870-**	Interstage EQ Value, Factory Selected for Slope. ** = dB value (1.5, 3.0, 4.0, 4.5, 5.0, 6.0, 7.0, 7.5, 9.0, 10.5, 12.0, 13.5, 15.0, 16.5, 18.0)	
QPML1000-**	Interstage EQ Value, Factory Selected for Slope. ** = dB value (1.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.5, 15.0, 16.5, 18.0)	
QES42-**	Reverse EQ Value. ** = dB value (0-12 dB in 1 dB increments)	
SXP-TY-**	Plug-in Attenuator Pads. ** = dB value (0-20 dB in 1 dB increments)	
DTS240250UC-P5-ET	External Universal AC Power Supply, 100-240 VAC, 47-63 Hz Input, 24 VDC Output	
#951	120 to 26 VAC Transformer, 50 VA	
<b>Shipping Weight</b>	7.5 lbs (3.4 kg)	
<b>Dimensions</b>	9.125H" x 7.0"W x 3.562"D (23.18H x 17.78W x 9.05D cm)	

Figure #5: QFN Ordering Information



## Service & Support

### Contact ATX Networks

Please contact ATX Technical Support for assistance with any ATX products. Please contact ATX Customer Service to obtain a valid RMA number for any ATX products that require service and are in or out-of-warranty before returning a failed module to the factory.

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### Warranty Information

All of ATX Networks' products have a 1-year warranty that covers manufacturer's defects or failures.



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