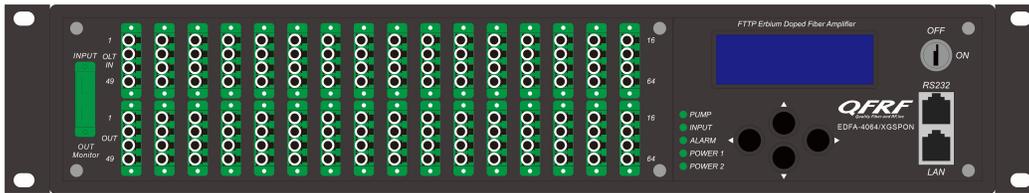![QFRF Quality Fiber and RF, Inc logo]

1550nm CATV Erbium Doped Fiber Amplifier - EDFA Series

40 dBm Total Output Power - 64 X 18.5 dBm Ports
Dual -48 VDC Power Supplies
Optical Output Test Point - SNMP Management

USER MANUAL

EDFA-4064/XGSPON

CONTENTS

1.0 PRODUCT SUMMARY

1.1 Product summary

The EDFA-4064/XGSPON is a low noise, high performance, FTTP high power, multi-port optical amplifier with band gain within 1540~1563nm spectrum.

It includes such advanced features as: dual AC power supplies for redundancy, a -20 dB Output Optical test port, and SNMP network management.

The EDFA-4064/XGSPON optical amplifier is compatible with any FTTx PON Technology, and offers a flexible and low-cost solution for three-network integration and Fiber-to-the-Home.

The EDFA-4064/XGSPON has an extremely low noise figure, with the entire unit adopting a twin-stage amplification. The optical pre-amplifier utilizes a low noise EDFA, while the output cascade uses a high power EYDFA. When input optical power Pin=0dBm, the noise figure of unit is typically ≤4.5dB, with a maximum of ≤5.5dB, unlike other EDFA's which need high optical power input in order to maintain a low noise figure.

The EDFA-4064/XGSPON optical amplifier uses the world's top class pump laser and active optical fiber. With features like precise APC, ACC and ATC control, and excellent design in the ventilation and heat-dissipation, the customer can be assured of the long life and high reliability of the pump laser. Having both RS232 and RJ45 ports offers serial communication and SNMP network management.

The LCD screen on the front panel shows both the operating conditions of the EDFA and any warning alarms. The pump laser will be switched off automatically whenever optical power is removed, which offers security protection for the laser. As an option, all of the optical ports of the optical amplifier can be installed on the front panel or back panel.

Also as an option, the EDFA can be equipped with dual optical inputs (built-in 2x1 optical switch), so it can be used in a self-healing ring network or redundant backup network.

The EDFA-4064/XGSPON has carrier-class reliability and network security management, high quality, high reliability and excellent cost performance making it ideal for system integrators and system operators.

EDFA optical amplifier: 19" 2RU chassis, total output power up to 40dBm (10,000mW), maximum 64 optical outputs and 64 uplink optical ports.

1.2 Product features

1. Low noise, high performance.
2. Total output power: 400~10,000mW.

3. 8~64 uplink optical ports, for OLT. (PON option)

4. 8~64 1550nm output optical ports, to multiply the 1310/1490 data stream.

5. Both RS232 communication interface and network SNMP function.

6. High-efficiency installation, easy operation, flexible.

7. High performance to price ratio.

1.3 Main Application

1. FTTP (EPON, GEPON, XGSPON)

2. Triple-play

2.0   SAFETY INFORMATION

2.1 Safety instructions

Do not plug-in/out the output optic connector when the unit is under operating status (KEY ON). Otherwise, the high power laser will burn the fiber core at the connector and will cause low output power. If the user needs to plug-in/out or adjust the output connector, please turn the unit OFF first with key switch (KEY OFF).

2.2 Connector cleaning guide

Optical fiber connectors require care and careful cleaning. Caps should be left on connectors whenever they are not in use. Do not touch the connector end. Damage to connector end faces caused by improper care is not covered by the warranty.

Cleaning procedure

WARNING:

After making sure that the light source is off (!), check the connector ferule end using the connector inspection microscope. If no dirt, grease or small particles are visible no further cleaning is necessary.

Use canned air to remove loose particles.

Either: Use automatic connector cleaner such as "Cletop". Wipe the connector as directed on the box. Be careful with angled connectors (connectors with green boots) to make sure the full surface contacts the cloth. You will need to tilt the connector slightly. Using an automatic cleaner is our preferred technique. Note that some low cost cleaners may leave small particles on the fiber surface.

Or: Moisten a clean optical wipe with alcohol and wipe connector. Finish by wiping the connector with a dry part of the wipe. Be careful not to allow oil from fingers to contact connector. Allow the connector to dry for 1 minute. Inadequate drying can result in the alcohol residue burning into the connector end when the fiber is lit.

Inspect the connector ferule under the microscope. Clean again if necessary.

If a connector is to be used to transmit high powers ($>$50mW), great care should be taken in cleaning. Mating of these connectors should be kept to a minimum.

Bulkhead cleaning
Fiber bulkhead adapters contain a zirconia or phosphor-bronze sleeve. After removing the connectors, these can be cleaned with a pipe cleaner moistened with isopropyl alcohol, and dried with canned air.

Trouble shooting

Q: A small black area appears in the middle of the connector which cannot be remove by cleaning.

A: Some material (typically oil from skin contact, residue alcohol or particles from connector cleaning devices) has burnt on the connector surface. Do not use your device and contract for assistance.

Q: A small circle of dried droplets are visible on the end of the connector.

A: The connectors were mated when they are still wet (typically from water/alcohol). Repeat cleaning procedure.

Q: The connector is clean but the loss on mating varies by 10dB or more.

A: Check to see if the bulkhead adapter sleeve is cracked. Be careful not to over-tighten connectors.

Q: A gray powdery grime continues to appear on the connectors after repeated matings.

A: If the bulkhead adapter sleeve is made from phosphor-bronze, some of the metal is probably rubbing off on the connectors. Use zirconia ferrule instead.

3.0 INSTALLATION

3.1 Unpacking

Inspect the shipping boxes for any obvious damages, and unpack the unit from the box.

Inspect the appearance of the unit for any shipping damages.

Document and inform the shipping company and your local representative, as seen in section 1.2, of any damages.

Save the shipping boxes and their inserts for any future reshipment for upgrade or repair.

NOTE: In the event of a reshipment back to the manufacturer, any additional damages caused by not using the original boxes will be considered the responsibility of the customer.

3.2 EDFA Mounting and Power Connection

1. Place the unit into a 19-inch wide rack or cabinet. Make sure to leave a 1.75-inch (about 4.5cm) space above and below the unit.

2. According to the design request, the EDFA-4064 1550nm EDFA can work under 0°C~50°C (32°F~122°F) temperature range. We recommend 25°C (77°F) environment temperature.

Humidity not higher than 95% (under non-condensing conditions). It is highly recommended that the equipment be kept within a suitable temperature & humidity environment. We also recommend the EDFA be operated in a dust-free environment.

3. Equipment can be powered either by AC -48 volt DC power. Where it is equipped with both AC & DC, AC is the main power supply.

Power supply requirements:

AC input	94-245VAC, 50-60Hz
DC input	36-60VDC, floating
Power consumption	Maximum 50W

4.   The DC power supply of the equipment must be the SELV supply stipulated as CAN/CSA C22.2 No.950-95 standard.

5. The machine should have good grounding with a resistance of <4Ω. According to the international standard, the AC plug adopts the tri-wire rule, with the middle wire being the grounding wire.

Before connecting power, please use large gauge (#20AWG or bigger) electric wire to connect the grounding screw on the bottom and the grounding frame. When using the DC input power supply, the equipment chassis must be grounded.

3.3 Optical connection

1. Clean all fiber patch cords before connecting to the transmitter.

Cleaning Guidelines:

Fiber Patch cord connectors

- Remove the fiber connectors dust cap and wipe the fiber connector tip with a dry lint-free cloth (such as Kimwipes). Inspect for scratches or debris on connector surface by using a microscopes (ie.100x or 200x).

- If no scratches or debris are found the connector is now clean and ready for connection. If debris or scratches are found then repeat the fiber patch cord connector cleaning guidelines.

Fiber Bulkhead connectors

- Compressed air may be used to clean fiber bulkhead connectors. Use compressed air with at least the following specifications:

   - Non-residue, inert gas for precision dust removal

   - Ultra-filtered to < 0.2 microns

   - Recommended for optical systems

   - Using compressed air as listed above, remove the bulkhead dust cover and hold the can of compressed air about 6 inches from the connector. After spraying a few short bursts into the bulkhead the connector is clean and ready for connection.

- If compressed air is not available, the transmitter fiber bulkhead connector may be cleaned by 2.5 mm cotton swap or connector plate may be removed to clean the internal fiber patch cords.

> **CAUTION**: Be cautions when handling fibers.
> Do not exceed fiber manufacturers pulling tension or bend radius
> specifications when removing fiber bulkhead connector plate.

   - To remove the transmitter optical connector plate, remove the screw on the far left of the optical plate and remove the screw on the far right of the optical plate. Do not remove the screws on the optical bulkhead connector.

   - Slowly remove the optical connector plate from the rear panel and disconnect each fiber connector from the bulkhead mounted on the plate.

   - Clean each fiber connector according to section A of the fiber cleaning guidelines.

2.   Make sure the laser key switch on the front panel of the transmitter is in the OFF position.

3.   Connect two fiber patch cords, one from the output of the transmitter to the EDFA, the other from the output of the EDFA to an optical power meter.

4.   First turn the transmitter laser key switch to the ON position, then turn on the EDFA.

5.   Using the optical power meter, verify the transmitter optical power is within specification.

6.   Turn the transmitter laser key switch to the OFF position.

4.0   EDFA CONTROLS, INDICATORS, AND ALARMS

This section of the manual will give an overview of the available menus in the EDFA series EDFA and their descriptions. All instructions in Section 4.0 refer to the representation of the front panel shown in the diagram below. The user scrolls through the menus by pushing the bottoms found on the front panel of the EDFA, just in the right of the LCD screen.
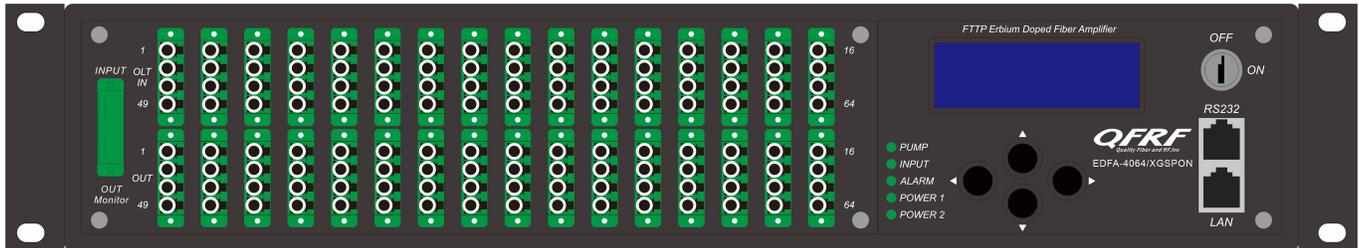
4.1 The operation of the front panel

4.1.1 Open menu

A.   Plug in both -48 VDC power supplies

B.   Turn on the power switches on the back panel:

   Front panel display "KEY OFF"

   Laser   Status lamp Red

C.   Turn ON the key switch:

   Front panel shows "KEY ON…", the Laser status lamp will turn from RED to GREEN.

4.1.2 Start-up main menu

Press ▲ \▼ button will display below menu in sequence.

Menu #1 -   Model
Read-only menu, tells the type of this equipment

Menu #2 -   S/N
Read-only menu, tells the serial number of this equipment

Menu #3 -   Input
Read-only menu, tells the input optical power of EDFA

Menu #4 -   Set Output

Adjustable list, displays the output power

Menu #5 -   Total Output
Read-only menu, tells the output optical power of EDFA in dBm.

Menu #6 -   Each Output
Read-only menu, tells the each output of EDFA in dBm.

Menu #7 -   PA Current
Read-only menu, tells the pre pump current of EDFA

Menu #8 -   PA Temp
Read-only menu, tells the pre pump temperature of EDFA

Menu #9 -   BA Current
Read-only menu, display the multi-mode amplify current of EDFA

Menu #10 -   Power1

Read-only menu, tells the status of power supply #1

Menu #11 -   Power2

Read-only menu, tells the status of power supply #2

Menu #12 -   Unit Temp
Read-only menu, tells the case temperature

Menu #13 -   IP
Adjustable list, display the IP address

Menu #14 -   SUB
Adjustable list, display the subnet address of the net mask

Menu #15 -   GW
Adjustable list, display the gateway address

Menu #16 -   TR1
Adjustable list, display the TRAP1 address

Menu #17 -   TR2
Adjustable list, display the TRAP2 address

Menu #18 -   LCD Contrast Level

Adjustable list, display the LCD contrast level adjustment

Menu #19 -   Reset Settings

Adjustable list, display the reset settings

4.1.3 Assistant manual

1. Set output power (optional)

Under the menu of Set Output, press the ▲▼ button at the same time to enter into modified menu, press ▲/▼ button to increase or decrease value, press the ▲▼ button at the same time to save and exit.

2. Set IP、Submask、Gateway、Trap1、Trap2 menu

Choose IP, Submask, Gateway, Trap1,Trap2 menu, Press the ▲/▼ to select the menu that need to modify ,press the ▲▼ at the same time to enter into the modified menu, press the ▲▼ at same time to select the modified key mapping, press the ▲/▼ button to modify the value on this position, and then press the ▲▼ at same time to save and exit.

Such as, modify IP setting address menu, IP: 192.168.000.015, if need to change 5 to 6, press the ▲▼ at same time to enter into the IP address menu, press the ▲▼ button at same time to select this position of 5 and then press the ▲/▼ button to change the 5 to 6, then press the ▲▼ button at same time to save, after amending, the IP: 192.168.000.016.

3. Set LCD Contrast Level menu

Choose LCD Contrast Level menu, then press ▲▼ button at same time to enter into modify status, press ▲/▼ button to increase or decrease the value, press   ▲▼ at same time to save.

4. Set Reset Settings menu

Choose Reset Setting menu, then press ▲▼ button at same time to enter modify status, press ▲/▼ button to select the restore factory setting, press the ▲▼ button at the same time to save and exit.

5.0   PORT AND CABLE ASSIGNMENTS

EDFA series provide the following manage port:

RS232 port: be suitable for examining EDFA parameters and some system configuration by PC machine RS232 port.

SNMP: Simple network management protocol

Before connection EDFA series of the port, please read the following instructions and port connectivity requirements.

5.1 Management Port (RJ-45)

5.1.1 Port Description

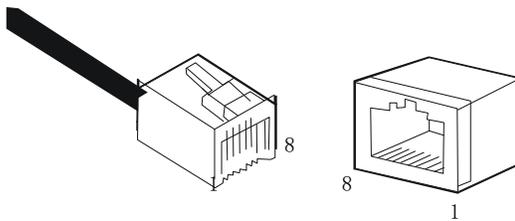The EDFA series management port connector type is RJ-45.

Figure 5.1.1 RJ–45 Connector Plug and Socket

The Management port (RJ-45) can be connected to any device that uses a standard network interface (e.g., a workstation, server, bridge or router). RJ-45 MDI can be connected with similar network equipment (such as other EDFA or network Hub). Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3, 4 or 5 cable for 10 Mbps connections or 100- ohm Category 5 cable for 100 Mbps connections. Beside, please ensure that the cable length does not exceed 100 meters.

5.1.2 Pin assignment

When network management reticle (RJ-45 connector in each side) connects NMS PC and EDFA series directly, it should use straight reticle. See Figure 5.1.2.

Figure 5.1.2   RJ-45   connector   straight   through connection
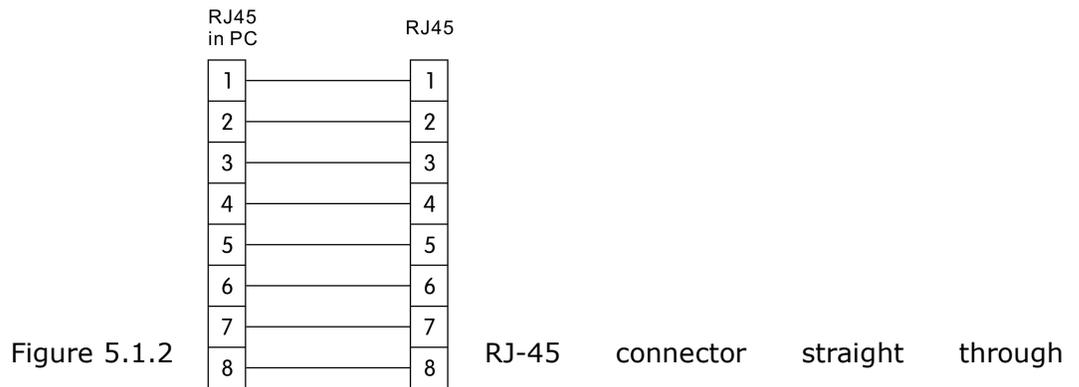
PIN	Workstation port	MDI
1	Input receive data+	Output transmit data+
2	Input receive data-	Output transmit data-
3	Output transmit data+	Input receive data+
6	Output transmit data-	Input receive data-
4, 5, 7, 8	Nonuse	Nonuse

Table 5-1 RJ-45 Pin assignment

Straight		Cross	
(EDFA)	(Adapter)	(EDFA)	(HUB/ EDFA)
1 IRD+	1 OTD+	1 IRD+	1 IRD+
2 IRD-	2 OTD-	2 IRD-	2 IRD-
3 OTD+	3 IRD+	3 OTD+	3 OTD+
6 OTD-	6 IRD-	6 OTD-	6 OTD-

Table 5-2 Straight and cross cable connecting

5.1.3 Port Connection

This EDFA series can auto-detect the Ethernet cable type (Straight-though or Crossover), so either type can be used. An Ethernet twisted pair cable should be connected between the RJ-45 connector (MDI-X) of the EDFA series and any device with a standard network interface (such as a work station or server), or to a network interconnection device (such as a bridge or router).

1) Ensure that the device to be connected has a 10BASE-T or 100BASE-TX network interface card

2) Prepare a twisted pair Ethernet cable with RJ-45 plugs on each end. Use Cat 3, 4 or 5 cable for standard 10Mbps Ethernet connections, or Cat 5 cable for 100Mbps Fast Ethernet connections.

3) Plug one end of the cable into the PC's NIC and plug the other end into any RJ-45 port of the EDFA series. All the EDFA RJ-45 port supports both 10Mbps and 100Mbps Ethernet connections. Ensure that the plug's locking tab clicks into proper position to make good access.

Caution: Do not plug a phone jack connector into the RJ-45 port. This may damage the EDFA. Instead, use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Note:

1) Connect other compatible EDFA series or network hub, adopt direct or across cable to connect MDI port in other device.

2) Ensure that the twisted pair cable length does not exceed 100 meters.

3) Cat 5 cable is recommended for all network connections to avoid confusion or inconvenience, when upgrading to Fast Ethernet devices in the future.

4) Cascade length provision: IEEE 802.3 standard prescribes that through twisted pair at most 4 hub (such as repeaters) can be cascade, and IEEE 802.3u standard has more strict order for high-speed Ethernet. So, when cascade device except for this EDFA series, please following the above connection regulation. But please pay attention because EDFA series divide the connected path into unattached port, don't reckon in the EDFA series or connected cable related device in cascade length.

5.1.4 Connection Management (Out-Band)

Remote management can be performed through the dedicated Management port (10/100BASE-TX port) on the front of the EDFA or any 10/100BASE port of EDFA.

Before the Management port be accessed through LAN port, please configure the IP address and subnet mask by serial port according to network configuration requirement.

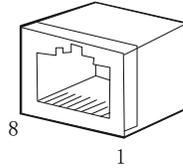### 5.2 RS232 Console port (DB9)

5.2.1 Port Description

Figure 5-2.1 DB9 interface

DB9 interface is a standard connectors used in RS232 in series communication connects. OLT adopt 9 pin standard connector which is the same as the connector of PC Com interface.
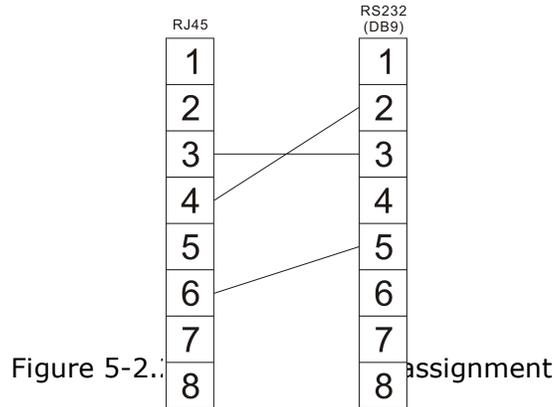
5.2.2 Pin assignment

Figure 5-2.2 Pin assignment

Pin	Distribution
2	RXD: accepting of data
3	TXD: transmitter data
5	SG: signal

Table 5-3 Pin information

5.2.3 Port connection

This EDFA series is also equipped with a cable to connect the EDFA to a serial port. This cable has a DB9 connector on both the EDFA and the PC side. Consult figure 5.2.1.

According to the following steps to connect cables:

1) Through RS232 (DB9) cable, connect a super terminal program PC to RS232 port in EDFA series back panel. For example, connect one COM port in PC (com 1~4) and one RS232 port of EDFA series.

2) Setup terminal analogue type VT100, distribute a COM (com 1~4) to connect with EDFA series RS232, then setup communication mode as follows:

1. Data bit: 8

2. Stop bit: 1

3. Parity check: No

4. Baud: 9600 bps (applies to initial configuration)

5. Flow control: No

5.3 Power Connection

5.3.1 Connection Description

The power module provides stable operating power for the system, to meet the power supply requirements of all the components in the system.

6.0 FAULT ALARMS

The FTTP EDFA-4064/XGSPON monitors system operations, and not only offers brief notes of warning, but it can also correct for the majority of status variations in the equipment, such as: system parameter changes, equipment tolerances, laser aging, RF level changes, and temperature changes. The PUMP laser will continue to function even when the EDFA is in ALARM. The alarm can either be discontinued manually, or when the related system parameter recovers into the normal range. Some serious alarms can be eliminated by simply rebooting the power supply of the equipment. The warning will also disappear automatically whenever the related parameter recovers to its normal range.

A major warning will be sent out when the correction ability is close to or exceed the permitted range. In most situations, the user cannot modify these major warning parameters. Repairs or modifications for a major warning will need special equipment, so the modifications can only could be processed at the factory.

6.1 Warning status

When pump laser is on warning status, the status LED will turn red and the brief note of status will be displayed on the screen. The warning will not stop the EDFA-3616/XGSPON from functioning, it only shows which parameter has exceeded the normal scope slightly. If the warning has stopped, it shows that the relative parameter has returned to the permitted range. The screen & LBD will return to their normal status and there is no need for the user to interfere. But, it should be emphasized that the problem shown by the alarm should not be ignored, because it is possible there could be a serious underlying system fault.

Work status	Status display	LED color	Explanation
Present laser deflection is low	Key Off	Red	The EDFA isn't working. It's shut down.
Present case temp	-	Red	Warning when the temp ≥60°C.
Input	Input Low	Red	Optical output power is low.
Output	Output Low	Red	Optical output power is low.

Table 6-1 Warning status

6.2 Alarm status

When the pump laser sends out a warning, it has usually stopped working. The alarm is generally because some relative parameter has exceeded the safe working range which could possibly causes damage to the laser. Some alarms can be eliminated by simply rebooting the power supply or resetting the key switch. If you can't reset or eliminate an alarm, please contact our company immediately.

6.3 Fault prevention

User can notice below information to prevent some potential problems.

1. Please place the pump laser under environment temperature 0°C ~50°C, other conditions accords with requested running range. We suggest placing the EDFA in low dust environment.

2.   Ensure the rear panel fans are clear and running, & front panel slots are clear.

3.   Check the power supply to see whether it works in stipulated standard scope. And check all the connections are correct.

4.   Check the changing of RF gain, and control it in the permitted range.

5.   Keep the optic fiber connector clean & joint properly. Prevent output optic power decreasing result from optic leakage.

7.0 GUARANTEE AND REPAIR ITEMS

1. Each unit is packaged with a Products Qualification, the serial number, and a one-year full parts and labor warranty.
2. Micro-processor software, with the function of monitoring laser status, digital display, trouble alarm, network management etc. pump laser will not be damaged only by man-induced factor. In case of blinking RED LED (Alarm), please return the EDFA for repairs. The user should not open the top cover for repair, even within the warranty period, otherwise a material fee may be charged.
3. Lifelong maintenance and upgrades are provided even after the warranty period has expired.
4. If components are damaged by a man-induced factor, a material fee may be charged.

Quality Fiber and RF, Inc
http://www.qfrf.com
E-mail: jeff@qfrf.com   (772)545-9757