



CELLULAR FIBER OPTICAL
EXTENDER
(Donor & Server Units)
OPERATION
INSTRUCTION MANUAL
MODEL 51483-C

MD Office:

19516 Amaranth Drive
Germantown, MD 20874
Phone: 301-540-0700
Fax: 301-540-5743

NJ Office:

464 Hudson Terrace
Englewood Cliffs, NJ 07632
Phone: 201-227-0066
Fax: 201-227-0067

Email: mail@aerocomm-inc.com
<http://www.aerocomm-inc.com>

ALL INFORMATION CONTAINED IN THIS DOCUMENT IS PROPRIETARY TO AEROCOMM, AND SHALL NOT BE RELEASED, DISCLOSED OR DUPLICATED FOR ANY PURPOSE OTHER THEN EVALUATION, INSPECTION, OR MAINTENANCE OF EQUIPMENT DELINEATED HEREIN.

AEROCOMM IS NOT RESPONSIBLE FOR ANY EQUIPMENT REPAIRED OR ALTERED BY PERSONS NOT AUTHORIZED BY AEROCOMM, OR NOT IN ACCORDANCE WITH INSTRUCTIONS FURNISHED BY AEROCOMM. AEROCOMM IS NOT RESPONSIBLE FOR EQUIPMENT RENDERED DEFECTIVE AS A RESULT OF MISUSE, IMPROPER REPAIR, OR ABNORMAL CONDITIONS OF OPERATION, NOR DOES AEROCOMM ASSUME ANY LIABILITY FOR ANY CONSEQUENTIAL DAMAGE CAUSED BY SUCH EQUIPMENT.

SERVICE CONTRACTS OR CUSTOMER ASSISTANCE AGREEMENTS ARE AVAILABLE FOR AEROCOMM PRODUCTS THAT REQUIRE MAINTENANCE AND/OR REPAIR. AEROCOMM ALSO HAS AVAILABLE SERVICE AND CONSULTATION CONTRACTS FOR ENTIRE SYSTEMS CONFIGURATION.

CELLULAR FIBER OPTICAL
EXTENDER
MODEL 51483-C
(824-849MHz: 869-894MHz)

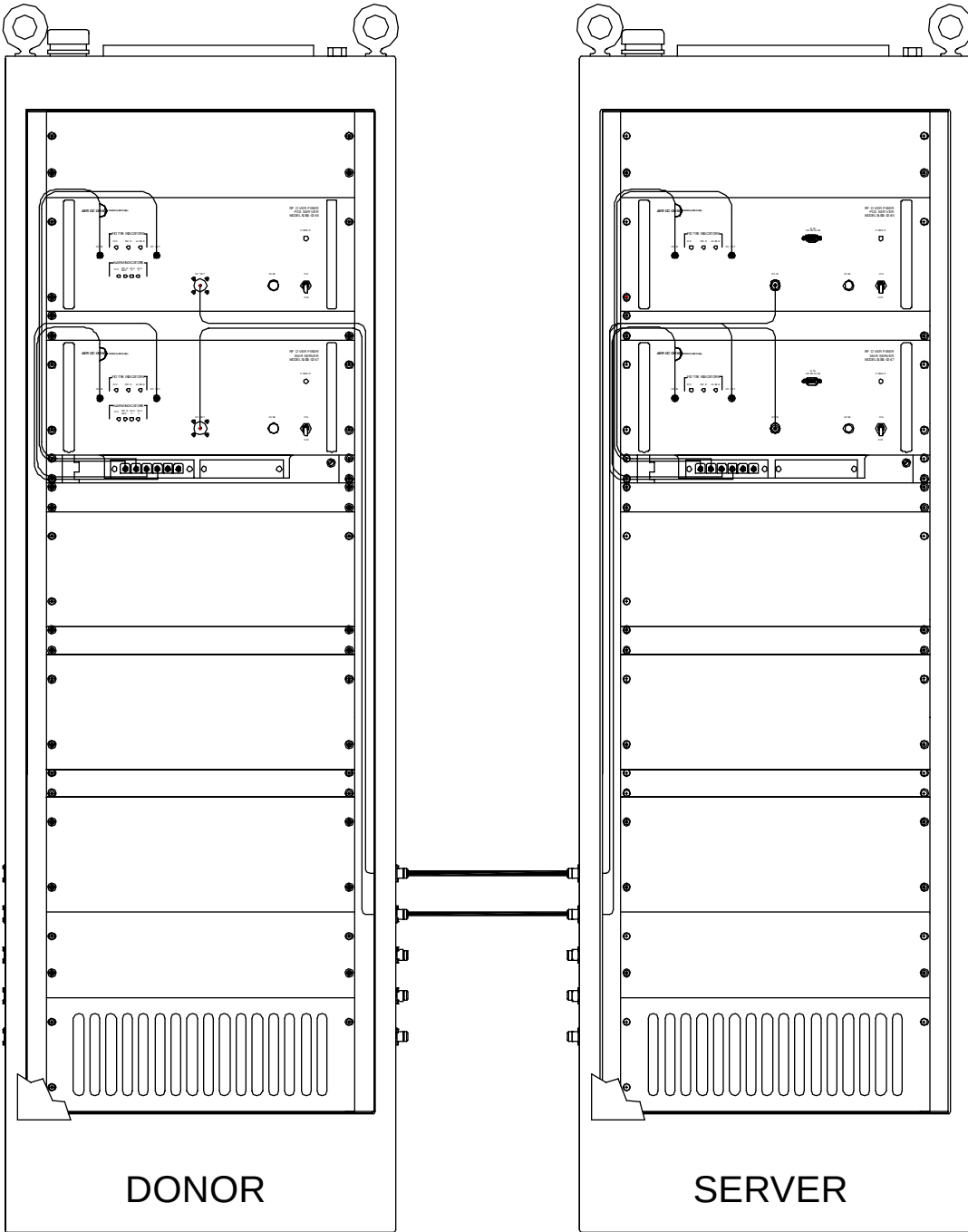


TABLE OF CONTENTS

<u>I. INTRODUCTION</u>	4
<u>PURPOSE OF MANUAL:</u>	4
<u>MANUAL OUTLINE</u>	4
<u>GENERAL SYSTEM OVERVIEW:</u>	5
<u>II. SPECIFICATIONS</u>	6
<u>GENERAL SPECIFICATIONS</u>	6
Service: CELLULAR.....	6
<u>SUB-ASSEMBLY SPECIFICATIONS:</u>	7
AC231.....	Error! Bookmark not defined.
51099 LNA.....	8
51211 LNA.....	8
51098 LNA.....	9
20dB Attenuator.....	9
6dB Attenuator.....	9
Duplexer.....	10
TX Filter.....	10
RX Filter.....	10
<u>III. INSTALLATION</u>	11
<u>RF CABLE CONNECTIONS</u>	11
<u>FIBER OPTICAL CABLE CONNECTIONS</u>	11
<u>IV. OPERATION OF EQUIPMENT</u>	12
<u>V. MAINTENANCE SCHEDULE</u>	13
<u>CABLE INSPECTIONS:</u>	13
<u>ENCLOSURE INSPECTIONS:</u>	13
<u>LED INSPECTIONS:</u>	13
<u>VI. THEORY OF OPERATION</u>	14
<u>VII. TROUBLESHOOTING</u>	15
<u>SERVER UNIT</u>	15
<u>DONOR UNIT</u>	16
<u>VIII. RECOMMENDED SPARES</u>	17

I. INTRODUCTION

PURPOSE OF MANUAL:

The purpose of this manual is to outline the installation, describe the operation, and assist in the maintenance and trouble-shooting of the CELLULAR Fiber Optical Extender, Model 51483-C.

MANUAL OUTLINE

Section II: Section II covers the general specification of the CELLULAR Fiber Optical Extender. This section outlines the general, mechanical and electrical specifications including the module specifications (sub-assemblies).

Section III: Section III covers the instructions for installing the CELLULAR Fiber Optical Extender, site requirements, and equipment initialization.

Section IV: Section IV covers Operation of Equipment.

Section V: Section V is the recommended schedule of periodic maintenance of CELLULAR Fiber Optical Extender.

Section VI: Section VI covers the general “Theory of Operations” of the logic and modules of CELLULAR Fiber Optical Extender. This section is designed to aid in understanding of the CELLULAR Fiber Optical Extender.

Section VII: Section VII consists of diagrams, tables and procedures to assist in the troubleshooting of a CELLULAR Fiber Optical Extender. This section is designed to guide a technician in locating system fault(s) to the module. Included in the section is a list of recommended test equipment.

Section VIII: Section VIII lists the recommended spare parts for the CELLULAR Fiber Optical Extender.

GENERAL SYSTEM OVERVIEW:

The AeroComm, Inc. Fiber Optic Booster Amplifier (Model#51483-C) can be used where CELLULAR Carrier Service is required but not accessible due to long or difficult coaxial cable runs. It eliminates costly construction using coaxial cable. The AeroComm, Inc. Model#51483-C converts the Carrier RF signal, enabling the use of Fiber Optic Cable which is easily routed to inaccessible areas and has much lower loss, where it is then reconverted back to Carrier RF signal.



II. SPECIFICATIONS

GENERAL SPECIFICATIONS

<i>Service: CELLULAR</i>		
Frequency Range:	<u>Uplink</u> : 824-849 MHz	<u>Downlink</u> : 869-894 MHz
Noise Figure:	6.3 dB Typical	7.0dB Typical
Gain:	51 dB Min.	51dB Min.
Delay:		5usec/Km
Output Power:	+22 dBm	+23 dBm
Input Power (No Damage):	-30 dBm Max	-30 dBm Max
Power Consumption:	1.2 A @ 110 VAC Per Donor/Server	
Weight:	21 lbs.	
Temperature:	-25C to + 75 C	
Size:	19" Rack Mount Unit, 4U (7"H) x 18"	
RF Connectors:	N-Female	
Fiber Optic Connectors:	FC/APC	
Cable:	9/125 mm Single Mode FO Cable	
Enclosure:	19" Rack Mount	

SUB-ASSEMBLY SPECIFICATIONS:

<i>RF TO FIBER MODULE</i>			
Parameter	Min	Typical	Max
Wavelength, peak:	1520nm 1280nm	1550nm 1310nm	1570nm 1360nm
Bandwidth:	50MHZ		2000MHZ
Frequency Flatness: (800-2000MHZ)		+ / - 1.5dB	
In & Out VSWR:		1.5:1	1.8:1
RF Isolation, In-band:		40	
Spur Free Dynamic Range:	103dB/HZ ^{2/3}	106dB/HZ ^{2/3}	
RF Link Gain:	-2dB	0dB	+2dB
Noise Figure WM option WA option WB option		34dB 38dB 42dB	
Input 3rd Order Intercept WM option WA option WB option		+22dBm +26dBm +29dBm	
Absolute Maximums			
Operating Temperature:	-30°C to +75°C		
Storage Temperature:	-40°C to +85°C		
Maximum RF Input to Transmitter:	+10dBm		
Maximum Optical Input to Receiver:	4mW		
D.C. Supply Voltage:	12 volts +\ -5%		

<i>51099 LNA</i>			
Parameter	Min	Typical	Max
Gain:	13dB	14.5dB	
Noise Figure:		1.5dB	1.8dB
VSWR:		1.5:1 / 1.3:1	
OP1dB:		+16.5dBm	
Input IP3:		+15dBm	
Reverse Isolation:		23dB	
Bias Current:		50mA	100mA
Input Voltage:	+10VDC	+15VDC	+30VDC
Absolute Maximum Ratings			
Input Power:		+17dBm	
Operating Temperature:		-30°C to +60°C	
Storage Temperature:		-40°C to +85°C	

<i>51211 LNA</i>			
Parameter	Min	Typical	Max
Gain:		35dB	36dB
Gain Flatness:	+/- 0.5dB	+/- 1dB	+/- 1.2dB
Noise Figure:		1.35dB	1.5dB
In / Out VSWR:		1.5:1 / 1.2:1	
OP1dB:	+22.5dBm	+23dBm	
Input IP3:		+36dBm	+41dBm
Reverse Isolation:		45dB	
Bias Current:		125mA	200mA
Input Voltage:	+10VDC	+13.5VDC	+17VDC
Absolute Maximum Ratings			
Input Power:		+17dBm	
Operating Temperature:		-30°C to +60°C	
Storage Temperature:		-40°C to +85°C	

<i>51098 Power AMP</i>			
Parameter	Min	Typical	Max
Gain:	28.5dB	30dB	31dB
Gain Flatness:	+/- 0.4dB		+/- 1.2dB
Noise Figure:		2.3dB	3.7dB
In / Out VSWR:		1.5:1 / 1.2:1	
OP1dB:	+35dB	+36dBm	
Input IP3:	+50dbm	+52dBm	
Input Voltage:	+12VDC	+13.5VDC	+18VDC
Bias Current:		1600mA	2000mA
Operating Temperature	-20°C		+60°C
Absolute Maximum Ratings			
VCC:		+20VDC	
Input Power:		+5dBm	
Current:		2200mA	
Operating Temperature:		-30°C to +70°C	
Storage Temperature:		-40°C to +85°C	

<i>20dB Attenuator</i>			
P/N:	BW-S20W2		
Frequency:	DC-18GHZ		
Accuracy:	±0.60		
VSWR:	<u>L</u>	DC-4GHZ	1.20
	<u>M</u>	4-8GHZ	1.25
	<u>U</u>	8-12.4GHZ	1.30
Power:	2W		

<i>6dB Attenuator</i>			
P/N:	BW-S6W2		
Frequency:	DC-18GHZ		
Accuracy:	±0.40		
VSWR:	<u>L</u>	DC-4GH	1.20
	<u>M</u>	4-8GH	1.25
	<u>U</u>	8-12.4GHZ	1.30
Power:	2Watts		

<i>Duplexer</i>	
P/N:	60024
Receive:	821-851MHz
Transmit:	866-895MHz
Passband Insertion Loss:	1.0dB maximum
Channel to Channel Isolation:	65dB minimum
Maximum Transmit Power Handling:	
CW	20 watts
Peak Instantaneous	80 watts
Passband Return Loss:	15dB minimum
Operating Temperature:	-30 to +70°C
Dimensions:	2.00"W x 2.97"D x 5.00"H
Connectors:	SMA- Female

<i>TX Filter</i>	
P/N:	5BCR12C-882.5/33-D
Passband:	869-894MHZ
3dB Passband:	34MHZ
Passband Insertion Loss:	2.5dB maximum
Rejection:	
DC - 849MHZ	60dB minimum
849 - 859MHZ	30dB minimum
914 – 3xFoMHZ	40dB minimum
Passband Return Loss:	15dB minimum
VSWR:	1.5:1 max.
Connectors:	SMA- Female

<i>RX Filter</i>	
P/N:	5BCR12C-840.5/33-D
Passband:	826-851MHZ
3dB Passband:	34MHZ
Passband Insertion Loss:	2.5dB maximum
Rejection:	
DC - 806MHZ	60dB minimum
806 - 816MHZ	30dB minimum
871 - 3xFoMHZ	40dB minimum
Passband Return Loss:	15dB minimum
VSWR:	1.5:1 max.
Connectors:	SMA- Female

III. INSTALLATION

The CELLULAR Fiber Optical Extender is housed in a 19" Rack Mount enclosure. Refer to Figure 1 for the installation block diagram.

RF CABLE CONNECTIONS

- The RF cable from Donor Antenna to the DONOR UNIT is connected to female N-Type Connector on the CELLULAR DONOR front panel RF PORT.
- The RF cable from Server Antenna to the SERVER UNIT is connected to female N-Type Connector on the CELLULAR SERVER front panel RF PORT.

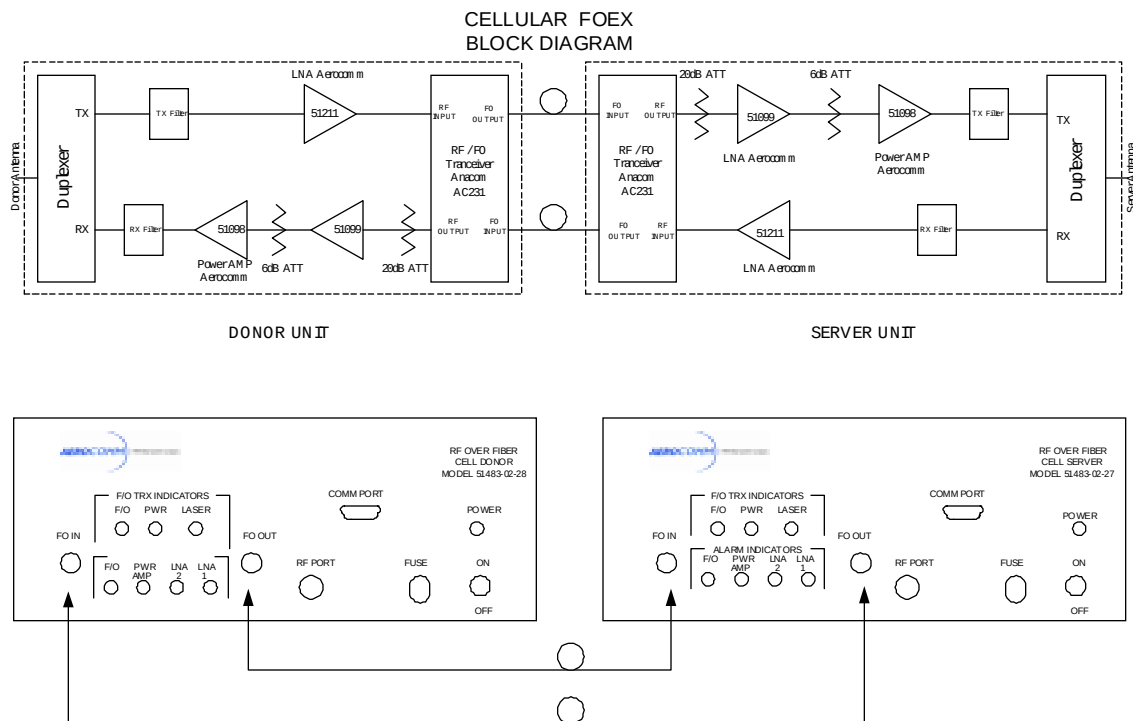
FIBER OPTICAL CABLE CONNECTIONS

The FC/APC to FC/APC fiber cables is connected between Donor and Server front panel.

- Donor FO OUT connects to the Server FO IN.
- Donor FO IN connects to the Server FO OUT.
- ✧ **Caution:** The FC/APC Fiber Optic connector is a Keyed connector, if the Key is not mated properly the connector will not mate. Extreme caution must be maintained to avoid touching the end of the fiber optic connector and getting it dirty.
- ✧ Coaxial and Fiber Optic cables are supplied by user.

AC POWER CONNECTIONS

Connect AC Line Cord to the 110VAC Power Sources.



IV. OPERATION OF EQUIPMENT

The CELLULAR Fiber Optical Extender requires no operator settings for operation. It is designed for unattended operation.

The following is all that is necessary for operation:

- ◆ Install
- ◆ Connect
- ◆ Turn-On
- ◆ Watch LED

V. MAINTENANCE SCHEDULE

The CELLULAR Fiber Optical Extender is designed for unattended operation requiring minimal maintenance. General maintenance consists of equipment inspection and operational tests. Periodical equipment tune-up and alignment is recommended.

CABLE INSPECTIONS:

The external and internal cables and connectors should be checked for indication of corrosion.

ENCLOSURE INSPECTIONS:

The interior of the enclosures should be inspected for evidence of condensation.

LED INSPECTIONS:

DONOR UNIT

- ◆ POWER LED: ON
- ◆ F/O TRX INDICATORS
 - F/O LED: ON
 - PWR LED: ON
 - LASER LED: ON
- ◆ ALARM INDICATORS
 - F/O LED: GREEN
 - PWR AMP LED: OFF
 - LNA2 LED: OFF
 - LNA1 LED: OFF
- ◆ COMM PORT
 - Normal: Closed (Pin1 & Pin2)
 - Fault: Open (Pin1 & Pin2)

SERVER UNIT

- ◆ POWER LED: ON
- ◆ F/O TRX INDICATORS
 - F/O LED: ON
 - PWR LED: ON
 - LASER LED: ON
- ◆ ALARM INDICATORS
 - F/O LED: GREEN
 - PWR AMP LED: OFF
 - LNA2 LED: OFF
 - LNA1 LED: OFF
- ◆ COMM PORT
 - Normal: Closed (Pin1 & Pin2)
 - Fault: Open (Pin1 & Pin2)

The performance of operations testing is recommended to be done semi-annually. Operational testing will indicate equipment status, determining if an alignment is necessary.

VI. THEORY OF OPERATION

The CELLULAR Fiber Optical Extender has two channels, one is Down Link frequencies from 869MHZ to 894MHZ, and the other is UP Link frequencies from 824MHZ to 849MHZ. Both Up Link and Down Link signals are converted from RF signals to optical signals then through the fiber optical cable to the far end and converted back to RF signals. The AeroComm, Inc. Fiber Optic Booster Amplifier (Model#51483-C) can be used where CELLULAR Carrier Service is required but not accessible due to long or difficult coaxial cable runs. It eliminates costly construction using coaxial cable. The AeroComm, Inc. Model# 51483-C converts the Carrier RF signal to optical signals, enabling the use of Fiber Optic Cable which is easily routed to inaccessible areas and has much lower loss, where it is then reconverted back to Carrier RF signal.

Caution: The user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the device (CFR 47 section 15.2)

NOTE: 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 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 this own expense.

VII. TROUBLESHOOTING

This Troubleshooting Procedure has been developed for the use of a trained technician with knowledge of troubleshooting methodology in order to isolate faults to the unit level.

SERVER UNIT	
Problem	Solution
1. Power LED is off	a) Check Fuse, if fuse is ok go to next step. b) Check Power Supply 110VAC input, if 110VAC is present, go to next step. c) Check Power Supply +12VDC output. If +12 volt is not present, replace the Server Unit.
2. PWR LED is off (F/O TRX INDICATORS)	a) Replace the Server Unit.
3. LASER LED is off (F/O TRX INDICATORS)	a) Replace the Server Unit.
4. F/O LED is off (F/O TRX INDICATORS)	a) to Problem 8.
5. LNA1 LED is on (ALARM INDICATORS)	a) Replace the Server Unit.
6. LNA2 LED is on (ALARM INDICATORS)	a) Replace the Server Unit.
7. PWR AMP LED is on (ALARM INDICATORS)	a) Replace the Server Unit.
8. F/O LED is red (ALARM INDICATORS)	a) Check the FC/APC Connectors and insure they are mated properly. Using a cotton swab cleaner, and alcohol clean the FC/APC connector. If F/O LED is still red, go to next step. b) Using a short FC/APC to FC/APC Fiber Optic Patchcord connect between FO IN and FO OUT. If LED is still red, replace the Server Unit. If LED is green go to next step. b) Check Fiber Optic Cable by using Fiber Test Meter, if Fiber Optic Cable is ok, the problem is on the Donor Unit.

DONOR UNIT	
Problem	Solution
1. Power LED is off	a) Check Fuse, if fuse is ok go to next step. b) Check Power Supply 110VAC input, if 110VAC is present, go to next step. c) Check Power Supply +12VDC output. If +12 volt is not present, replace the Donor Unit.
2. PWR LED is off (F/O TRX INDICATORS)	a) Replace the Donor Unit.
3. LASER LED is off (F/O TRX INDICATORS)	a) Replace the Donor Unit.
4. F/O LED is off (F/O TRX INDICATORS)	a) to Problem 8.
5. LNA1 LED is on (ALARM INDICATORS)	a) Replace the Donor Unit.
6. LNA2 LED is on (ALARM INDICATORS)	a) Replace the Donor Unit.
7. PWR AMP LED is on (ALARM INDICATORS)	a) Replace the Donor Unit.
8. F/O LED is red (ALARM INDICATORS)	a) Check the FC/APC Connectors and insure they are mated properly. Using a cotton swab cleaner, and alcohol clean the FC/APC connector. If F/O LED is still red, go to next step. b) Using a short FC/APC to FC/APC Fiber Optic Patchcord connect between FO IN and FO OUT. If LED is still red replace the Donor Unit. If LED is green go to next step. b) Check Fiber Optic Cable by using Fiber Test Meter, if Fiber Optic Cable is ok, the problem is on the Server Unit.

VIII. RECOMMENDED SPARES

We recommend units be sent to factory for repair or replacement.