ModuLite™

Installation Guide

Notice

Trademark Acknowledgement

Foxcom Wireless Offices

ISRAEL - HEADQUARTERS

Foxcom Wireless Ltd.

Tel: 972-8-918-3888

USA

Foxcom Wireless Inc.

Tel: 1-866-4-FOXCOM

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1. Front Chapter

1.1. Policy for Warranty and Repair

Foxcom Wireless tests and inspects all its products to verify their quality and reliability. Foxcom Wireless uses every reasonable precaution to ensure that each unit meets their declared specifications before shipment. Customers should advise their incoming inspection, assembly, and test personnel about the precautions required in handling and testing our products. Many of these precautions can be found in this manual.

The products are covered by the following warranties:

1. General Warranty

Foxcom Wireless warrants to the original purchaser all standard products sold by Foxcom Wireless to be free of defects in material and workmanship for one (1) year from date of shipment from Foxcom Wireless. During the warranty period, Foxcom Wireless will repair or replace any product that Foxcom Wireless proves to be defective. This warranty does not apply to any product that has been subject to alteration, abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

2. Specific Product Warranty Instructions

All Foxcom Wireless products are warranted against defects in workmanship, materials and construction, and to no further extent. Any claim for repair or replacement of units found to be defective on incoming inspection by a customer must be made within 30 days of receipt of shipment, or within 30 days of discovery of a defect within the warranty period.

This warranty is the only warranty made by Foxcom Wireless and is in lieu of all other warranties, expressed or implied. Foxcom Wireless sales agents or representatives are not authorized to make commitments on warranty returns.

3. Returns

In the event that it is necessary to return any product against above warranty, the following procedure shall be followed:

a. Return authorization is to be received from Foxcom Wireless prior to returning any unit. Advise Foxcom Wireless of the model, serial number, and discrepancy. The unit may then be forwarded to Foxcom Wireless, transportation prepaid. Devices returned collect or without authorization may not be accepted.

b. Prior to repair, Foxcom Wireless will advise the customer of our test results and any charges for repairing customer-caused problems or out-of-warranty conditions etc.

c. Repaired products are warranted for the balance of the original warranty period, or at least 90 days from date of shipment.

4. Limitations of Liabilities

Foxcom Wireless's liability on any claim, of any kind, including negligence for any loss or damage arising from, connected with, or resulting from the purchase order, contract, quotation, or from the performance or breach thereof, or from the design, manufacture, sale, delivery, installation, inspection, operation or use of any equipment covered by or furnished under this contact, shall in no case exceed the purchase price of the device which gives rise to the claim.

EXCEPT AS EXPRESSLY PROVIDED HEREIN, FOXCOM WIRELESS MAKES NO WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY GOODS, PARTS AND SERVICES PROVIDED IN CONNECTION WITH THIS AGREEMENT INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. FOXCOM WIRELESS SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

1.2. Conventions

In this manual the following special formats are used:

Note

Notes contain information detailing the current topic.

CAUTION

CAUTIONS CONTAIN INFORMATION REGARDING SITUATIONS OR MATERIALS THAT COULD DAMAGE YOUR PRODUCT.

Warning

WARNINGS CONTAIN INFORMATION REGARDING DANGEROUS FUNCTIONS.

1.3. Reporting Defects

The units were inspected before shipment and found to be free of mechanical and electrical defects.

Examine the units for any damage that may have been caused in transit. If damage is discovered, file a claim with the freight carrier immediately. Notify Foxcom Wireless as soon as possible.

Refer to Policy for Warranty and Repair for further details.

Note

Keep all packing material until you have completed the inspection.

1.4. RF Exposure Compliance

! Warning

TO COMPLY WITH FCC RF EXPOSURE COMPLIANCE REQUIREMENTS, ANTENNAS USED FOR THIS PRODUCT MUST BE FIXED MOUNTED ON INDOOR PERMANENT STRUCTURES, PROVIDING A SEPARATION DISTANCE OF AT LEAST 20 CM FROM ALL PERSONS DURING NORMAL OPERATION.
ANTENNAS MUST BE SEPARATED FROM EACH OTHER, ACCORDING TO THE SPECIFIC FCC STANDARD. FOR MODEL 810/840 ANTENNAS MUST BE MOUNTED SO THAT THERE IS AT LEAST 2M SEPARATION BETWEEN ANY TWO ANTENNAS

! Warning

Each individual antenna used for this transmitter must be installed to provide a minimum separation distance of 20 cm or more from all persons and must not be co-located with any other antenna for meeting RF exposure requirements.

1.5. Precautions

1.5.1. Personal Safety

The ModuLite™ system uses an optical laser for transmitting voice and data. The laser unit has the following output characteristics:

- Optical output power (mW): ≤3.0
- Wavelength (nM): 1310 ± 10

! Warning

APPLYING POWER TO THE MODULAR BASE UNIT AND MODULAR REMOTE CABINET WILL CREATE A LASER ENERGY SOURCE OPERATING IN CLASS I AS DEFINED BY IEC 60825-1, 21 CFR 1040.10 AND 1040.11 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE NO. 50 (JULY 26, 2001). USE EITHER AN INFRARED VIEWER, OPTICAL POWER METER OR FLUORESCENT SCREEN FOR OPTICAL OUTPUT VERIFICATION.

! Warning

THE USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

! Warning

COMPLIANCE WITH RF SAFETY REQUIREMENTS:

THE MODULITE™ HAS NO INHERENT SIGNIFICANT RF RADIATION.

THE RF LEVEL ON THE DOWNLINK IS VERY LOW AT THE MODULAR REMOTE CABINET DOWNLINK PORTS. THEREFORE, THERE IS NO DANGEROUS RF RADIATION WHEN THE ANTENNA IS NOT CONNECTED.

THE DESIGN OF THE ANTENNA INSTALLATION NEEDS TO BE IMPLEMENTED IN SUCH A WAY SO AS TO ENSURE RF RADIATION SAFETY LEVELS AND NON-ENVIRONMENTAL POLLUTION DURING OPERATION.

1.5.2. Equipment Safety

To avoid damaging your product, please observe the following:

1. Always keep the optical connector covered. Use the fiber optic cable or a protective cover. Do not allow any dirt and/or foreign material to get on the optical connector bulkheads.
2. The optical fiber jumper cable bend radius is 3 cm. Smaller radii can cause excessive optical loss and/or fiber breakage.

1.5.3. System Performance

! Warning

FOR PROPER SYSTEM PERFORMANCE USE ONLY CABLES EQUIPPED WITH SC/APC CONNECTORS TO CONNECT TO THE FOXCOM WIRELESS MODULITE™ SYSTEM.

SC/APC Connector

1.5.4. Power Supply

! Warning

DISCONNECT BOTH POWER SOURCES BEFORE SERVICING.

⊗ CAUTION

_____

_____

_____

FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH SAME TYPE AND RATINGS OF FUSES.

2. Introduction to the ModuLite™

Infrastructure for multiple services is currently provided through two different methods. The first method is a parallel infrastructure based on a fiber or hybrid fiber-copper solution. In this system, even though all operators provide mutual services with a potential for sharing, a complete infrastructure is deployed for every operator. Multiple antennas need to be installed in every radiation zone. Isolation between antennas is hard to control, and as a result, cross antenna interference may cause degraded performance.

The second available solution is based on coax. Coax has different attenuation levels for different frequencies. This leads to design constraints because the coax needs to match the highest frequencies serviced and their respective attenuation levels. This requirement leads to higher costs resulting from the larger diameter coax and from a more labor-intensive installation.

Foxcom Wireless's ModuLite™ is a new approach. The ModuLite™ is a high-performance, cost effective and modular In-Building system designed for multiple wireless services. It is technically superior to other available infrastructures, and provides WSP's and building operators with an advanced platform for expansion and upgradability.

Figure 1: ModuLite™ System

The ModuLite™ has unique advantages:

- **Low attenuation:** Singlemode fiber optic cables have virtually no attenuation (0.38dB/Km), relieving the need to install amplifiers or any other signal enhancing in-line devices. This factor alone greatly reduces the engineering and installation costs.

- **Low noise:** High bandwidth signals can be set over singlemode fibers without encountering noise problems, and transmitted over great distances.
- **Multi Services:** Same infrastructure is used either supporting single service or multiple services, due to the pseudo infinite bandwidth of singlemode fiber optic cable.

2.1. Applications

The **ModuLite™** addresses both public and private markets in order to provide RF distribution solutions for various structure types:

- Typical Public Market
  - Malls
  - Airports
  - Conventions Centers
  - Hospitals

- Typical Private Market
  - Office Buildings
  - Business Centers
  - Campus

Three types of applications are very common for both markets:

- High Rise Buildings
- Horizontal Structures
- Campus type

Foxcom Wireless' ModuLite™ addresses these application types with a powerful answer, while still flexible and future expandable. There are no limitations for building height or structure spread.

2. 2 Models

ModuLite™ products come in various models, each model covering a different frequency spectrum and standard.

Table 1: ModuLite™ Models

System Configuration	Service	Frequency Range (MHz)	
		Uplink	Downlink
U.S. Market	Cellular/PCS	824-849; 1850-1910	869-894; 1930-1990
	iDEN/PCS	806-824; 1850-1910	851-869; 1930-1990
	Paging/PCS	899-902; 1850-1910	928-941; 1930-1990
	WLAN/UNLICENSED	2412-2462	2412-2462
European & Asian Markets	900/DCS	890-915; 1710-1785	935-960; 1805-1880
	UMTS-FDD	1920 - 1980	2110 - 2170
	Cellular/DCS	824-849; 1710-1785	869-894; 1805-1880
	iDEN	811-821	856-866

Note

Detailed specifications for all models appear in the ModuLite™ Data Sheet

2.2.1 Certification

Foxcom Wireless products have met the approvals of the following certifying organizations:

ISO 9001

For Europe

CE 0681

For US

FCC 47 CFR part 15,22,24,90

⊗ CAUTION

In order to remain compliant with FCC Rule Section 15,204 for unlicensed operation in the 2.4 GHz ISM band, the Modulite 810/840 configuration must be as follows:

Access Point: CISCO 1200: FCC ID: LDK102042
Smart amplifier: Shockwave. Model: AMP – 24 – 1W
4 by 4 Service Combiner Hybrid Matrrix 4x4 Wlan 0.8-2.5 GHz model: HC-44-1
Coax cable, Access point to Amplifier Input Type: LMR–195-PUC, Minimum length: 14 Inch (Attenuation 0.5 dB), TIMES MICROWAVE SYSTEMS.
Maximum antenna gain: 5 dBi (ex: Mars Antenna model MA-CM36-15)

Modifications not expressly approved by Foxcom Wireless could void the user's authority to operate this equipment.

FDA-CDRH
UL

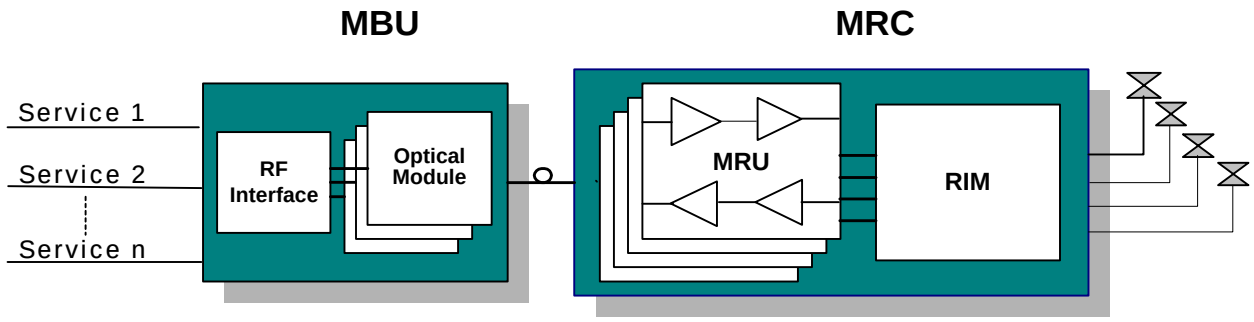
For Canada: RSS-118, RSS-119, RSS-133

System Description

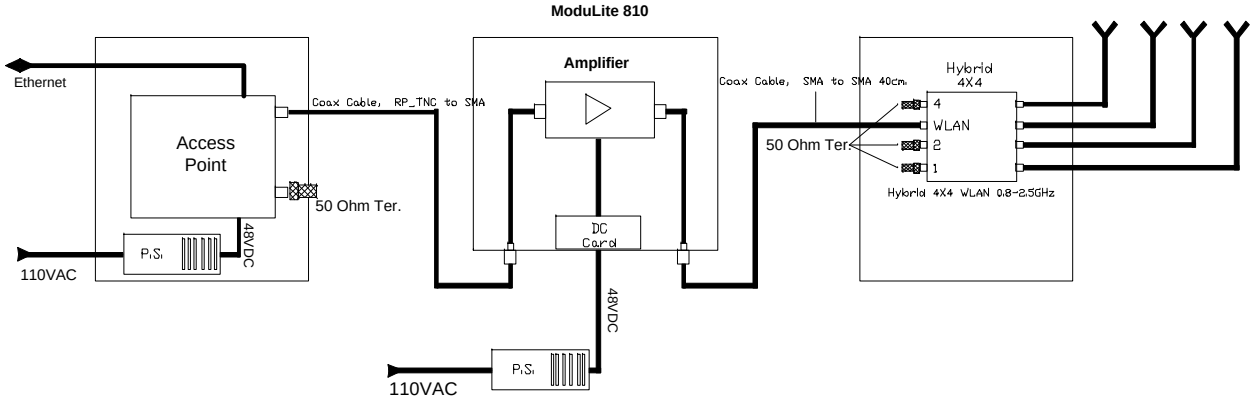
The ModuLite^{TM} is a new system for the provision of In-Building multiple wireless services. Its high performance yet cost effective structure efficiently enables the addition of new wireless services.

The ModuLite^{TM} is a hybrid fiber coax modular solution designed to serve multiple wireless services using a single common cabling infrastructure. The cabling infrastructure includes a fiber optic cable, a single coax cable, and a single antenna.

The ModuLite^{TM} has two main modules, the MBU (Modular Base Unit) and the MRC (Modular Remote Cabinet). Both components are designed such that they can be located in easily accessible area, such as the communication room, the communication closet, or in the riser.



ModuLite 810 Stand Alone



The MBU converts RF signals from the RF source (Base Stations/off- air repeater) to an optical signal using direct modulation technology. Each BU module can support two to four services, depending on the application. The MBU is connected via a single mode fiber optic cable to the MRC.
The MRC is comprised of modular remote units, each supporting two to four services, yet each modular remote unit has sub RF channels in order to maximize the performance of each specific service in terms of IMD suppression and dynamic range. Each MRC can contain four modular remote units, hence at least eight services. The RF modules can be added as required to support the required services. The MRC converts the optical signal to RF, performs filtering and enhanced signaling via its Remote Interface Module, and connects to a single antenna via a single coax cable.
The ModuLite's TM main features are as follows:
· Single cabling and antenna system for all services
o enables fast deployment for WSP's of new services
o reduces tenant disruption
o simplifies maintenance

- Upgradeable to include more than eight services per Modular Remote Cabinet (MRC), including 3G technologies
- Eliminates RF interferences occurring in parallel infrastructures due to cross antenna coupling
- Minimal input power to ModuLite™ (~0dBm) - No need for high power BTS/RBS, less expenses for the operators.
- MCU-Alarm Interface with open collector and dry contact alarms – the alarm loopback is activated when there is a broken or faulty optical fiber or no power in system.
- Low attenuation: Singlemode fiber optic cables have virtually no attenuation (0.38dB/Km), relieving the need to install amplifiers or any other signal enhancing in-line devices. This factor alone greatly reduces the engineering.

2.3. Product Drawings

The following drawings show sample front and rear panels of the ModuLite™ units.

2.3.1. Modular Base Unit- Four Ports

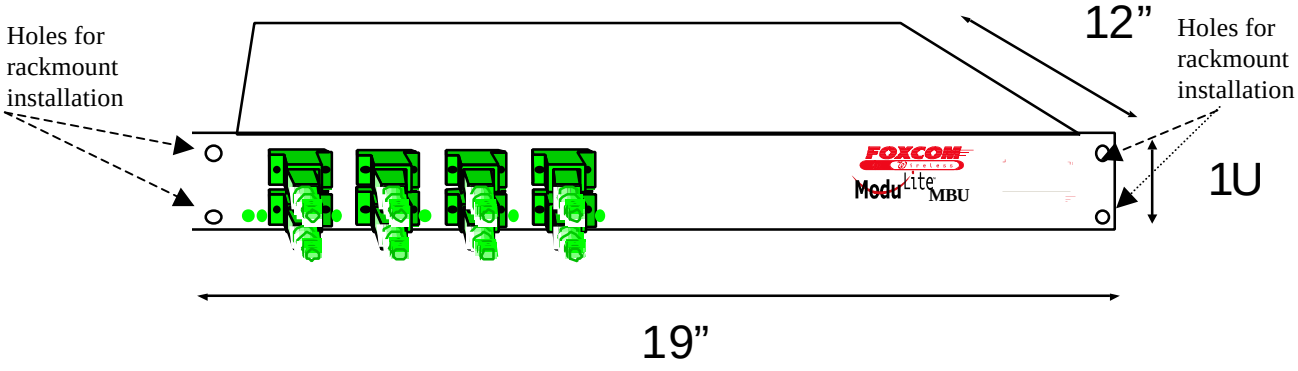


Figure 3: Modular Base Unit 4 Ports

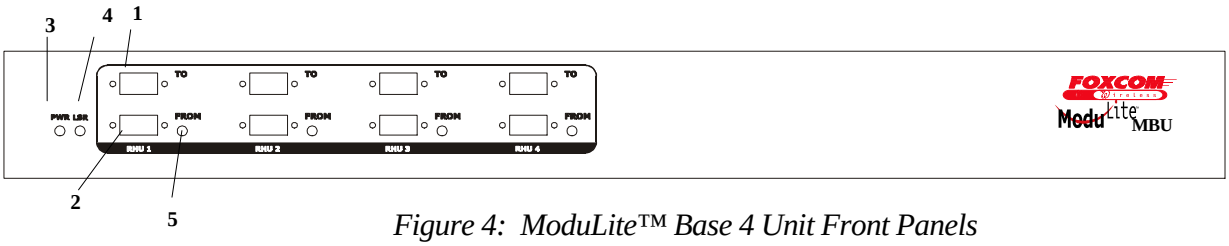


Figure 4: ModuLite™ Base 4 Unit Front Panels

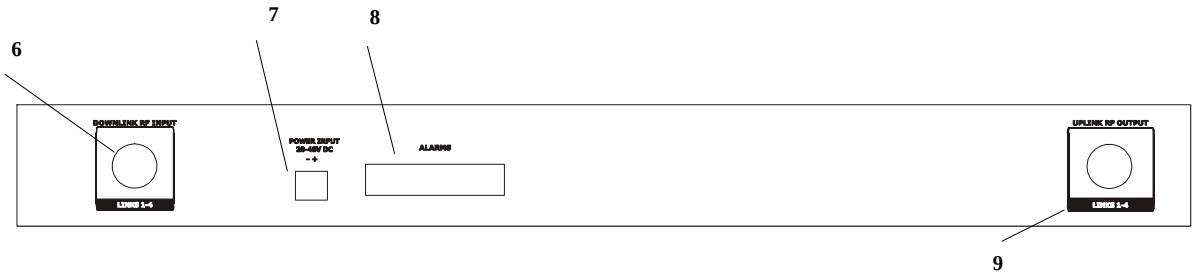


Figure 5: ModuLite™ Base 4 Unit Back Panel

Table 2: Modular Base Unit Description

Number	Description
1.	Laser Output connection to MRC
2.	Optical Diode Input from MRC
3.	Power LED indicator
4.	Modular Base Unit Laser operational LED indicator
5.	Modular Remote Cabinet Laser operational LED indicator
6.	Coax input from cellular headend
7.	Power input connector
8.	25 pin Alarm connector
9.	Coax output to cellular headend

2.3.2. Modular Base Unit- Eight Ports

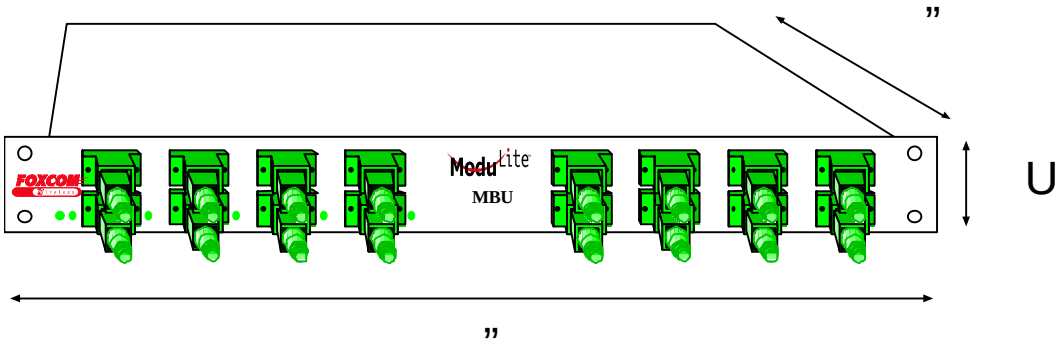


Figure 6: Modular Base Unit 8 Ports

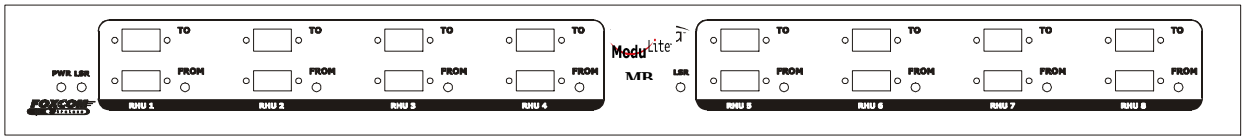
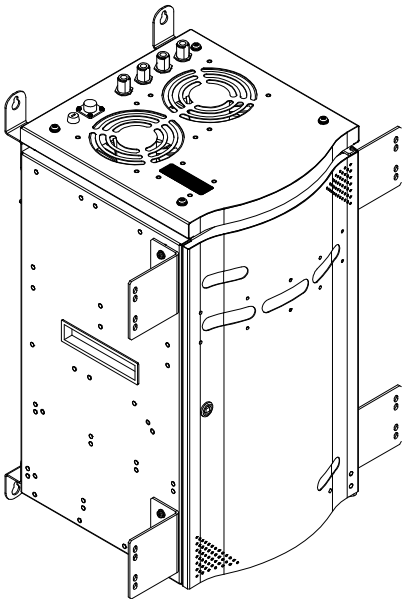


Figure 7: ModuLite™ Base 8 Unit Front Panels

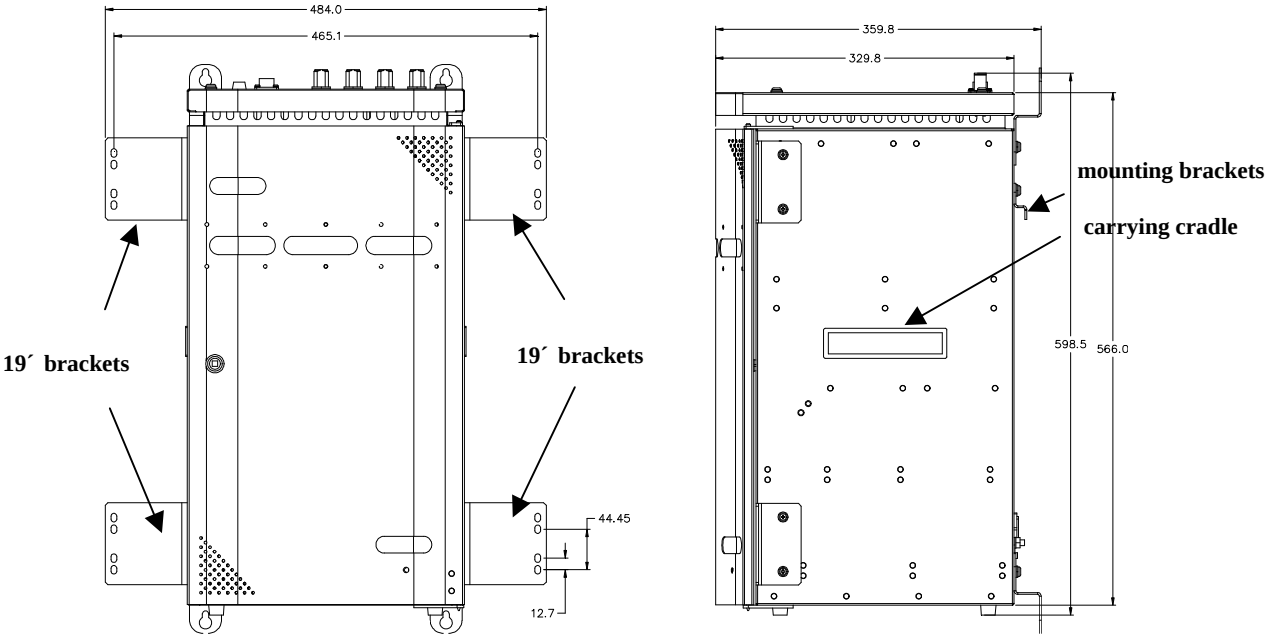
Figure 8: ModuLite™ Base 8 Unit Back Panels

2.3.3. Modular Remote Cabinet (dimensions in millimeters)

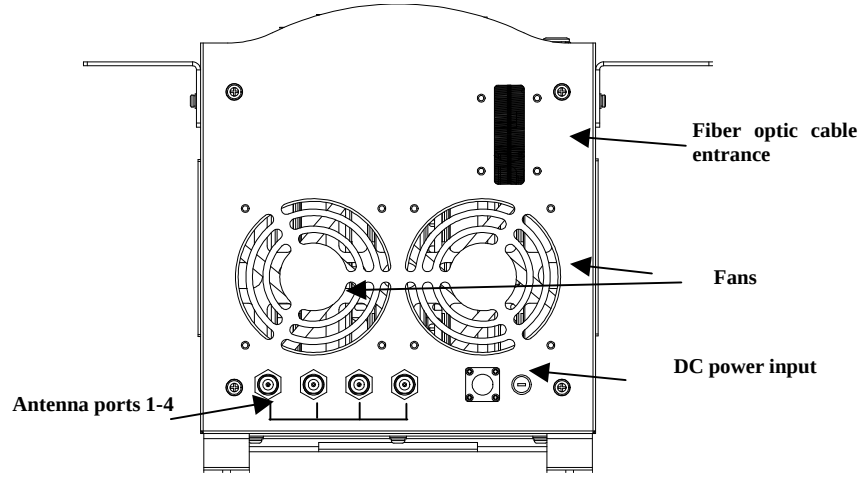
2.3.3.1. Isometric View



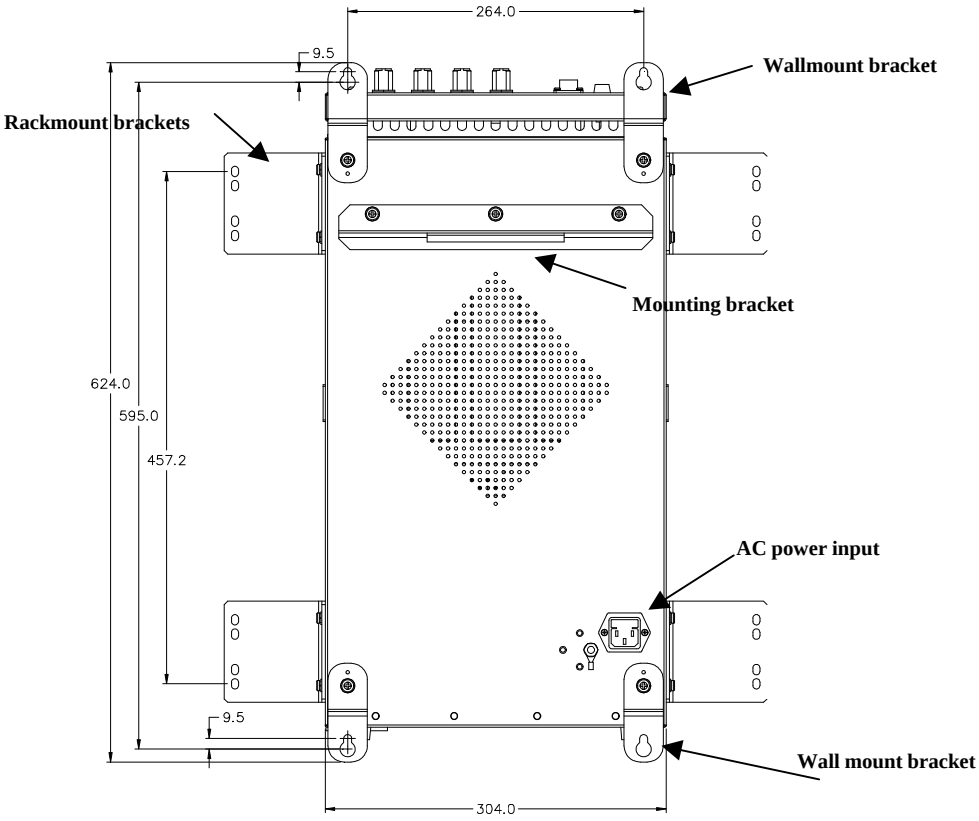
2.3.3.2. Front and Side View



2.3.3.3. Top View



2.3.3.4. Back View



Note: Depending on the user's preference, either wallmount or rackmount brackets will be assembled.

2.3.3.5. Module Front Panel

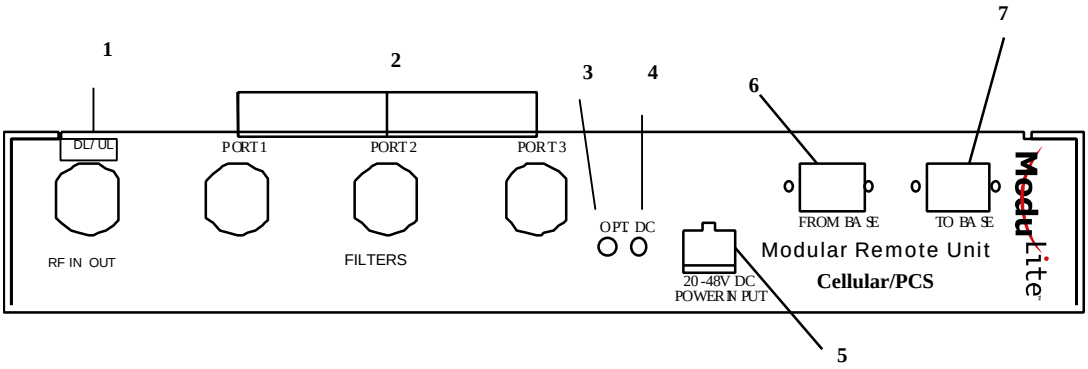


Figure 9: Modular Remote Cabinet Front Panel

Table 3: Modular Remote Cabinet Description

Number	Description
1.	RF In/Out
2.	Filters
3.	Optical LED for laser operation
4.	DC power LED for power operation
5.	DC power connector
6.	Optical input connector from Modular Base Unit
7.	Laser output connector to Modular Base Unit

3. Setup Tests

This ModuLite™ product has been checked thoroughly before reaching the customer. Foxcom Wireless attests to the suitability of this product for operation. Where the customer desires to check the fitness of the product, the appropriate tests are listed on the following pages.

The following describes the equipment required for testing the system at setup.

Table 4: Required Equipment List

Required Setup Equipment	Quantity
HP8753C Network Analyzer or equivalent	**1**
HP85046A S Parameter test set or equivalent	**1**
HP8594E Spectrum Analyzer or equivalent	**1**
Power supply /48 @ 5A	**1**
Signal generator HP8648B or equivalent	**2**
Amplifier Mini-circuit ZKL-2 or equivalent	**1**
Digital Multi-meter	**1**
RF Combiner Mini-Circuit ZAPD-21 or equivalent with N connectors	**1**
High-grade 50-ohm phase matched cables: **N to N cables** **N to SMA cables (in N remote type)** **SMA to SMA cables (in SMA remote type)**	 **4** **2** **3**
Optical power meter (1310 nm) of EXFO model number FOT-22A or equivalent	**1**
4 * Singlemode duplex fiber optic cable with SC/APC connectors	**3m**
Calibration kit, including **Through (N-female to N-female)** **Short (N-female)** **50 ohm (N-female)**	

This section explains the following test procedures:

- Pre RF Test
- Flatness Test
- Gain/IP3 Test
- Uplink Network Test

In order to carry out the tests, the following connections need to be made. (The tests can be performed on one service or several services simultaneously according to the implemented application).

Connect the Modular Base Units corresponding with the service optical output to the Modular Remote Cabinet's optical input via fiber optic cable.

Connect power to all units being tested (20V-48V DC).

Use the relevant setup test for each Modular Base Unit to each Modular Remote Cabinet.

3.1. Pre RF Test

To carry out the Pre RF Test, the following procedure needs to be carried out.

1. Make sure all DC LED's are lit on both units.
2. Measure Tx optical output power for all lasers.
3. Output power should be 1.8-3.7dBm (with optical power meter).
4. On the Modular Remote Cabinet, make sure that the optical LED's is lit on all services.
5. On the Modular Base Units, make sure the Rx optical LED's are lit.

3.2. Flatness Test

To carry out the Flatness Test, the following procedure needs to be carried out.

1. Connect the Network Analyzer to the service designated Modular Base Unit. On the Network Analyzer, the Modular Base Unit (according to the service) connects to port 2
2. On the Network Analyzer, the Modular Remote Cabinet connects to port 1 (see Figure 10).
3. After calibrating the network, set Network Analyzer to:

Measure	S21
Format	Log
Scale	1db/div

4. Apply with the required F1 and F2 should be according to Product Spec.
5. Measure the difference between the highest and the lowest signal point (which should be as specified in the data sheet).

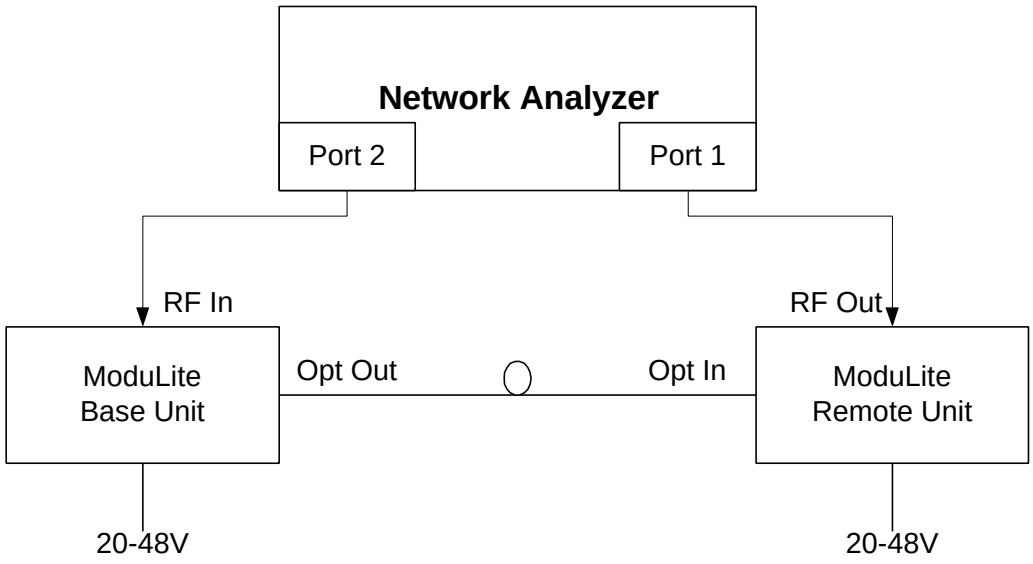


Figure 10: Network Analyzer Setup Test

3.3. Gain/IP3 Test

To carry out the Gain/IP3 Test, the following procedure needs to be carried out.

1. Set the 2 tone signal from the 2 signal generators. RF signals F1 and F2 should be according to Product Spec.
2. Combine the signals with ZAPD-21 combiner or equivalent.
3. Connect the 2-tone signal to the input of the base (see Figure 11).
4. Set Spectrum Analyzer to:

Video BW	10khz
RBW	100khz
Attenuation	20db
Span	30Mhz
Center freq.	Refer to Product Spec.
Ref level	10dbm

5. Connect the RF cable from the Modular Remote Cabinet output to the Spectrum Analyzer.
6. Measure output Gain/IP3 from all test MRC's downlink outputs.
7. IP3 is determined by:

IP3= power tone + (power tone – power IM3)/2.

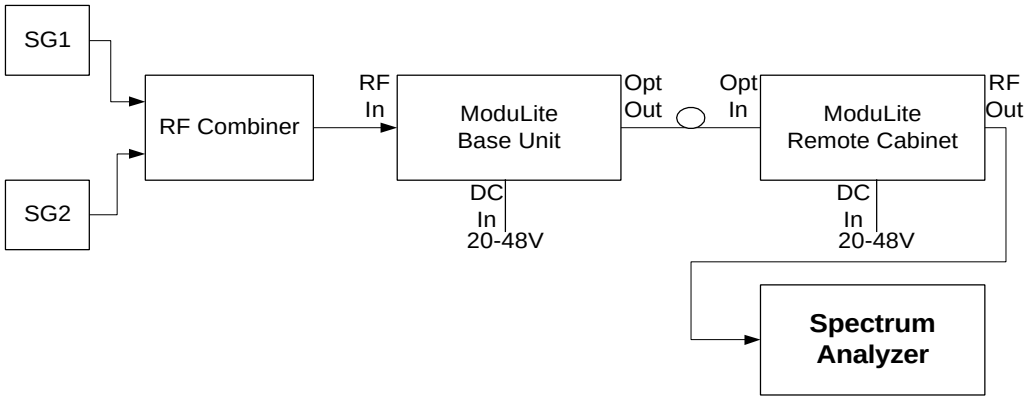


Figure 11: Spectrum Analyzer Setup Test

3.4. Uplink Network Test

To carry out the Noise Floor test, the following procedure needs to be carried out.

1. Connect the Spectrum Analyzer to the designated Modular Base Unit uplink port. Connect 50ohm terminators to the MRC ports, and to all Modular Base Unit uplink ports except for the tested port (see Figure 12).
2. Extra amplification (25db) is applied between Modular Base Unit and Spectrum Analyzer in order to measure the noise floor.
3. Set Spectrum Analyzer to:

Video BW	300hz
RBW	1khz
Attenuation	0db
Span	0hz
Center freq.	Refer to Product Spec.
Ref level	-50dbm
Marker noise	ON

4. The noise figure is formulated as: -174 + Gsystem + noise floor

(On the MRC, all unused ports must be terminated with 50ohm load.)

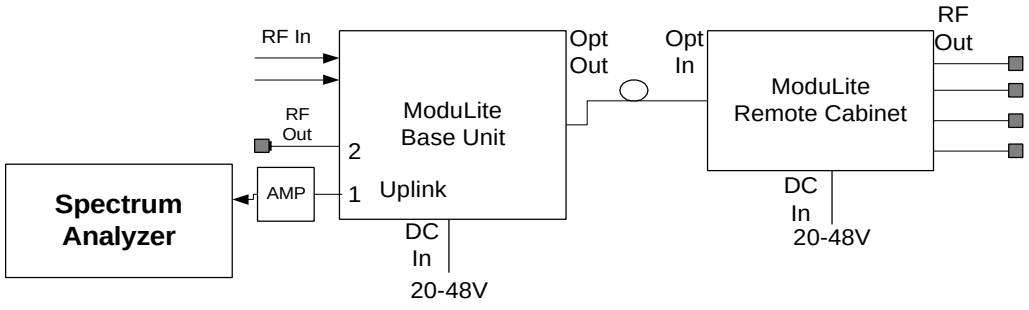


Figure 12: Uplink Network Test

4. Installation

The following sections describe the ModuLite™ installation.

- General Installation.
- Fiber Installation.
- Hi Rise Installation.
- Horizontal Layout Installation.

4.1. General Installation

The ModuLite™ components need to be set up, followed by performance verification before installing the system. Foxcom Wireless suggests that a 19" rack-mountable Splice Tray be used at the Modular Base Unit to facilitate optical fiber splicing. In the rack, the Splice Tray is mounted above or below the Modular Base Unit (depending on direction of the incoming cables).

The MBU and MRC units should be installed in a communication room that provides access to authorized personnel only. The units are maintenance free. In the event of failure, only authorized personnel should handle the units.

Set up procedures for the Modular Base Unit (MBU) and Modular Remote Cabinets (MRC) are for the following installations:

- High-rise installations.
- Horizontal layout installation.

For both installations, setting up the Modular Base Unit and Modular Remote Cabinets consists of the following steps:

1. **Determine antenna placement by system engineer**: When an area needs RF cellular augmentation, a RF engineer needs to determine the type and the location for each antenna. The RF engineer should consider all relevant RF parameters (RF propagation models, isolation between antennas in accordance with the appropriate standard, and environmental conditions) as well as landlord limitations.
2. **Determine the amount of antennas required**. This number, in turn, determines the number of Modular Remote Cabinets to be used. The number of Modular Remote Cabinets has a direct influence on the type and the number of fibers to be installed.
3. **Pull fiber optic cable and copper cables through building**. Install fiber optic cable according to the optic design (see Figure 17) Prepare 10% to 15% more fibers than are actually required. In order to supply D.C power to the Modular Remote Cabinets remotely, copper cables need to be installed in parallel to the fiber optic cable (see Figure 17).

4. **Install Modular Base Unit in 19" rack.** The number of Modular Base Units depends on the number of Modular Remote Cabinets. Each Modular Base Unit is installed with four screws on the front panel (two on each side) connecting to the 19" rack.
5. **Install patch panel/splice tray cabinet with SC/APC adaptors in a 19" rack or wallmount near Modular Base Units**. All fibers are installed in the patch panel, in which the backside is the fiber optic cable/cables coming from the remote side, and in the front side are SC/APC adaptors and SC/APC jumpers to the Modular Base Units.
6. **The fiber contractor splices fiber cable to the SC/APC connectorized pigtails.** In the communication room the fiber contractor splices/connects the fiber optic cable/cables coming from the remote end with SC/APC connectorized pigtails inside the patch panel cabinet. The pigtails connector will be connected to the SC/APC adaptors on the patch panel (from the inside).
7. **Connect SC/APC jumpers between SC/APC adaptors on the patch panel to the Modular Base Units.** For every optic link (MBU--MRC) there are two fibers – one uplink and one downlink per service.
8. **Connect BTS/RBS to Modular Base Units via ½" coax cable RG223 or similar with 50**W **impedance according the RF design** (see paragraph optical and RF connections).
9. **In the remote end connect pigtail/jumpers fibers from the splice box to each MRC**. One splice box can support several MRC's according to the optical design (normally three MRC's).
10. **Connect antennas to Modular Remote Cabinet via ½" or 3/8" or similar coax cable with 50**W **impedance and N-type male to male.**
11. **Connect power supply to Modular Base Unit and Modular Remote Cabinet** (refer to power planning). Each Modular Base Unit will be connected with D.C. cables (+, -) directly to the planned power supply. The MRC's will be connected to the D.C. cables through D.C. clamping coming from the communication room.

4.2. Environmental Data

Maximum ambient operating temperature:	50° C
Maximum ambient temperature in a rack:	50° C

4.3. Configuration Restrictions

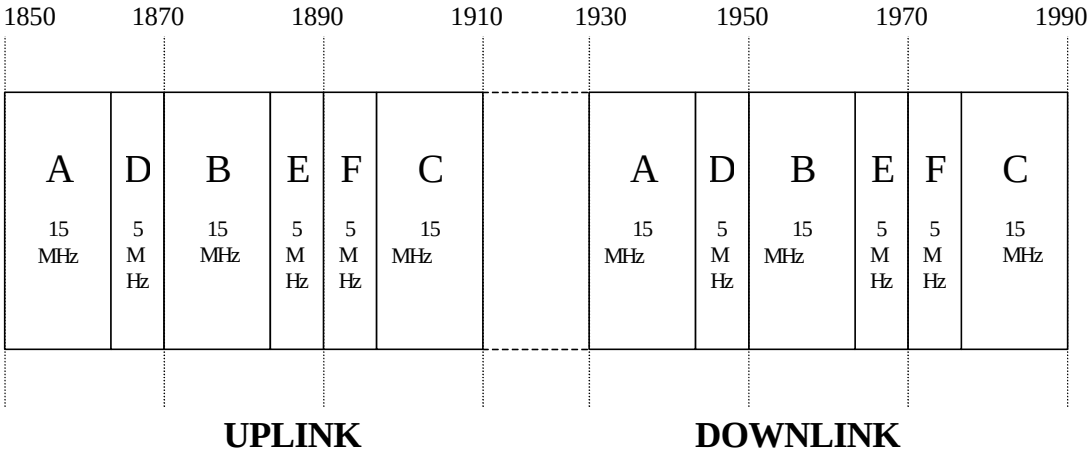


Figure 13: PCS Frequency Allocation

The following configuration restrictions apply: (Please refer to Figure 13 above.)

- PCS operator operating on block A and the Paging operator **must not** reside on the same MRU.
- PCS operator operating on block B and the SMR operator **must not** reside on the same MRU.
- PCS operator operating on block A and B and the SMR and Paging operators **must not** reside on the same MRU.
- The PCS band is divided into six blocks. Blocks A, B, and C are 15 Mhz and blocks D, E, and F are 5 Mhz. Only two adjacent blocks can be used on the same MRU. The adjacent blocks are: A and D, B and E, and F and C.

4.4. Environmental Data

Maximum ambient operating temperature:	45° C
Maximum ambient temperature in a rack:	45° C

4.5. Protective Earthing

See Figure 14 below, which describes how to connect the ground to the MRC. Connect the GND wire to the GND of the rack (for a rackmount) or to the GND of the building (for a wallmount).

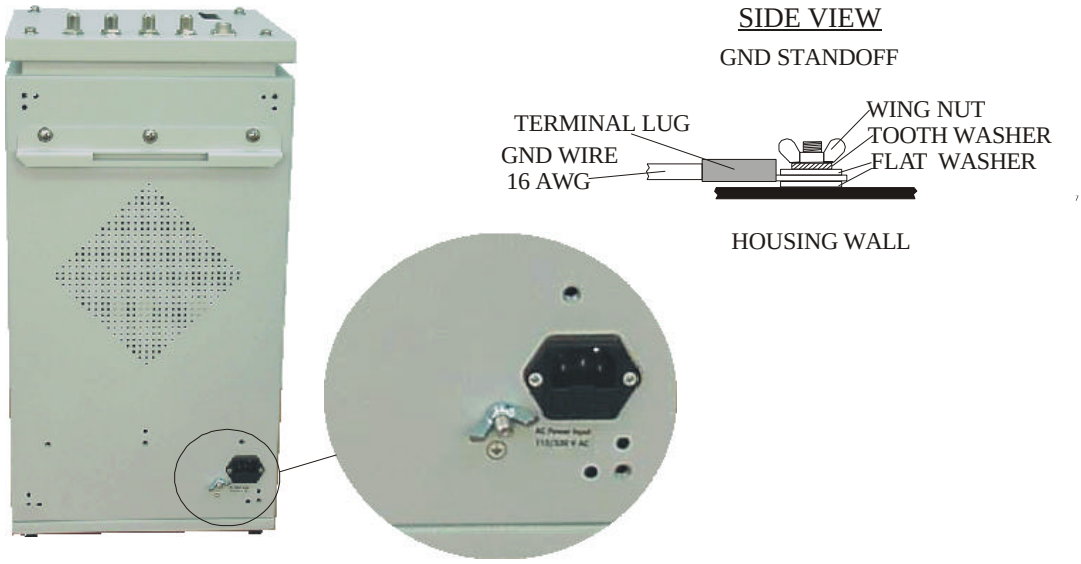


Figure 14: ModuLite™ GND Standoff Assembly Sequence

4.6. Wallmount Installation

(The following instructions apply to an installation on a concrete wall. For any other type of wall, contact the manufacturer.)

Please refer to Figure 15 and to Figure 16.

1. Attach the alignment template to the wall.
2. Using the template as a guide, drill seven holes for concrete anchors. Insert seven concrete anchors (McMaster-Carr catalogue number 92403A200, or equivalent). The middle holes are designated for the mounting bracket. The other four holes are for the wallmount bracket.
3. Carefully and thoroughly fasten the anchors to the wall.

4. Remove the three screws from the anchors in the holes designated in Figure 15 for the mounting bracket. In the other four anchors loosen but do not remove the screws.
5. Using the screws removed from the mounting bracket anchors, attach the mounting bracket through the three holes.
6. Insert the mounting bracket attached to the rear of the MRC into the mounting bracket attached to the wall while maneuvering the four wallmount brackets into the four screws previously loosened but not removed. Do not tighten these four screws so that the MRC can be removed without requiring any tools.

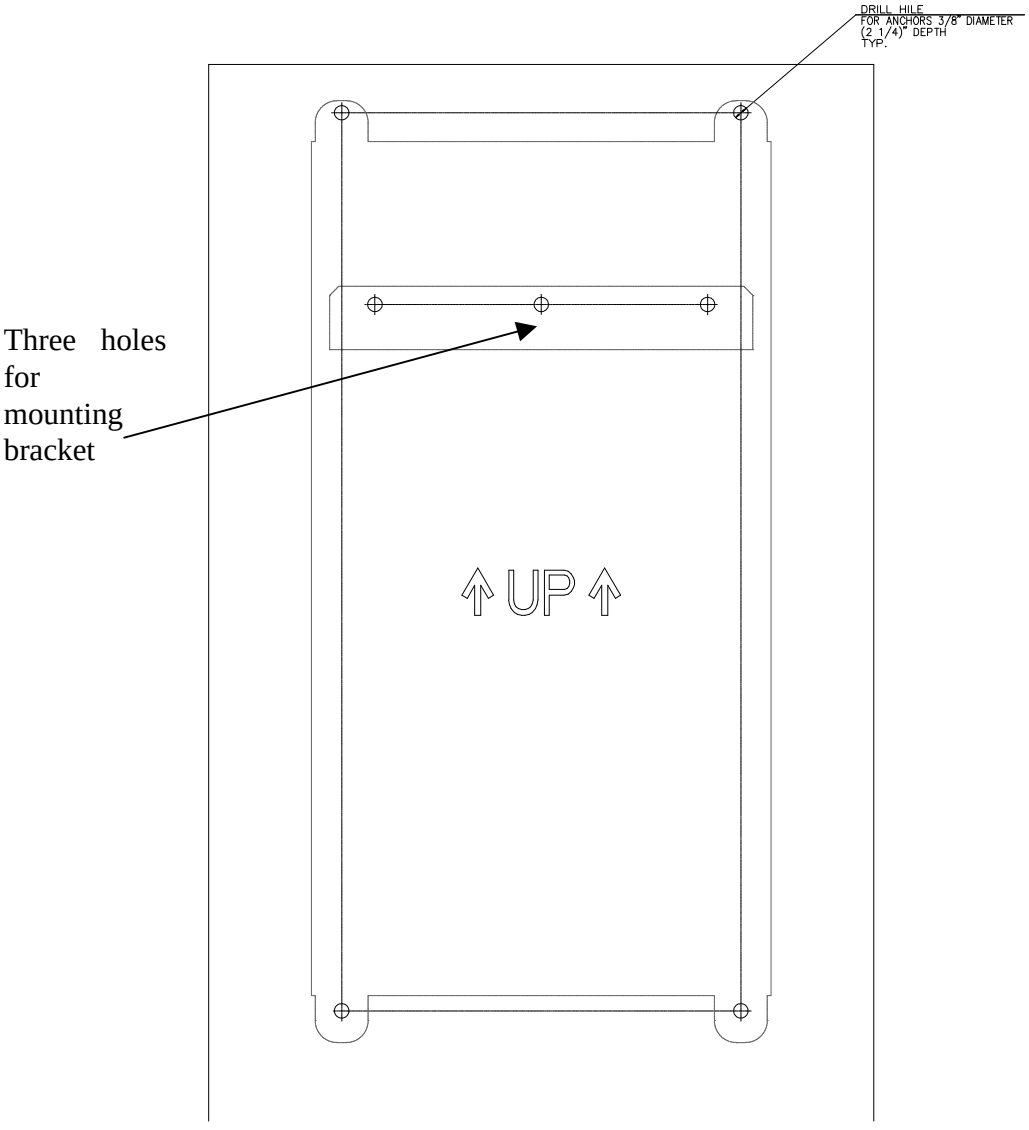


Figure 15: Wallmount Template

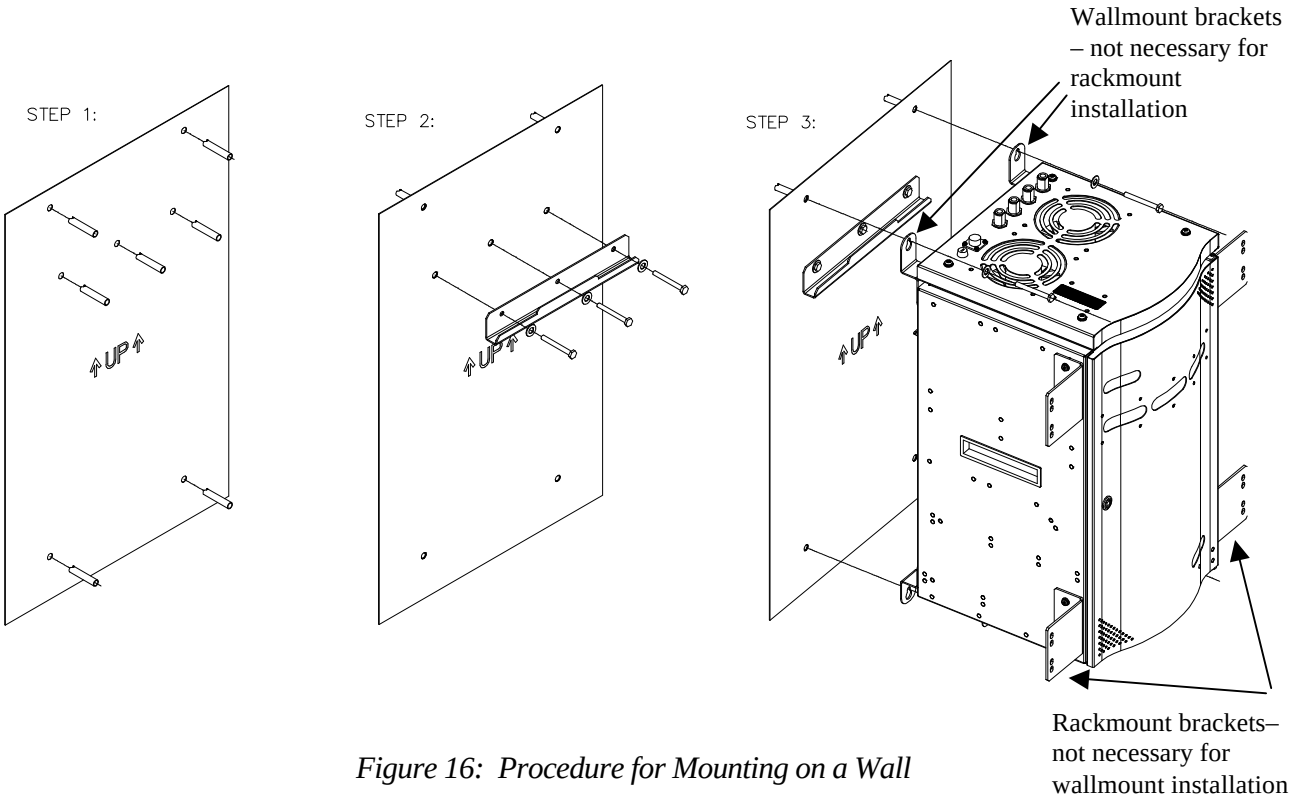


Figure 16: Procedure for Mounting on a Wall

4.7. Rackmount Installation

For a rackmount installation, attach the MRC to the rack using the rackmount brackets (see Figure 16). The MRC should be hung in the lower section of the rack. Use 12 mm M6 screws.

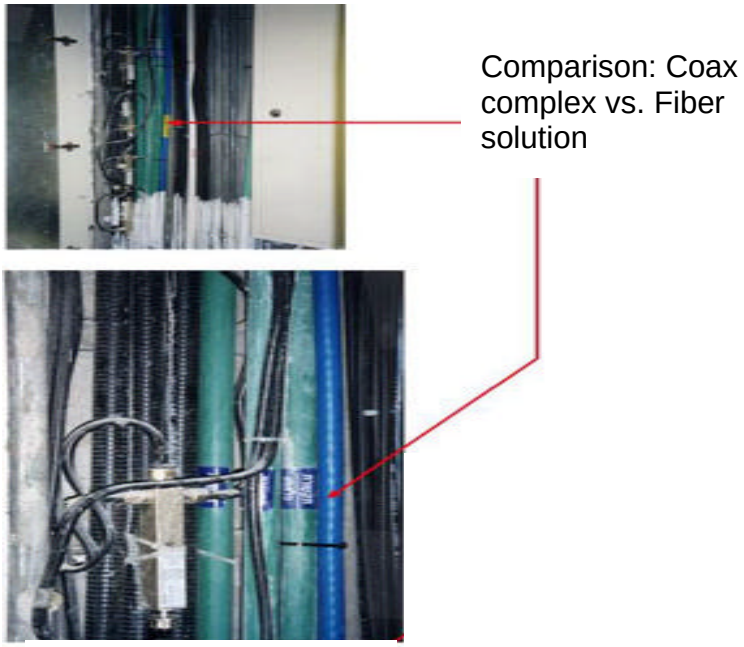
The MRC requires a clearance of 10 cm above the unit. If a heating source is installed beneath the MRC, a buffer must be placed between the MRC and the surface.

For MBU rackmount installation, see Figure 3. Use 12 mm M6 screws.

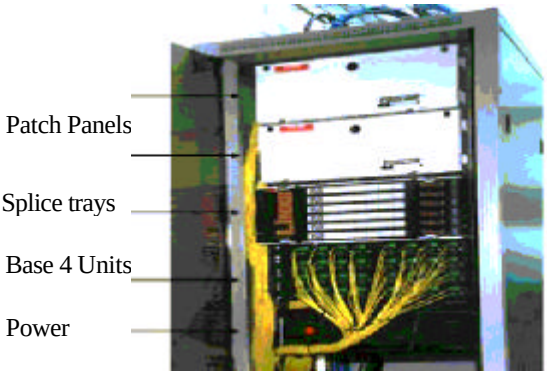
4.8. Fiber Installation

The following procedure describes the process for setting up fiber optic cable for the system (see Figure 17).

1. Pull fiber optic cable and DC cable through building structure



2. Install splice tray (when used) in 19” rack near Modular Base Unit.



3. Near Modular Base Unit, install patch panel cabinet (**SC/APC** adaptors) for fiber optic cable connections.

4. Connect (3/125/900) pigtail with **SC/APC** connectors between splice tray and patch panel cabinet.

5. Connect (3/125/3000) **SC/APC** jumpers between the corresponding Modular Base Unit and patch panel.

6. Install splice box near MRC (refer to optic planning).

7. Connect fiber optic cable to splice box and (3/125/3000) pigtails to MRC.

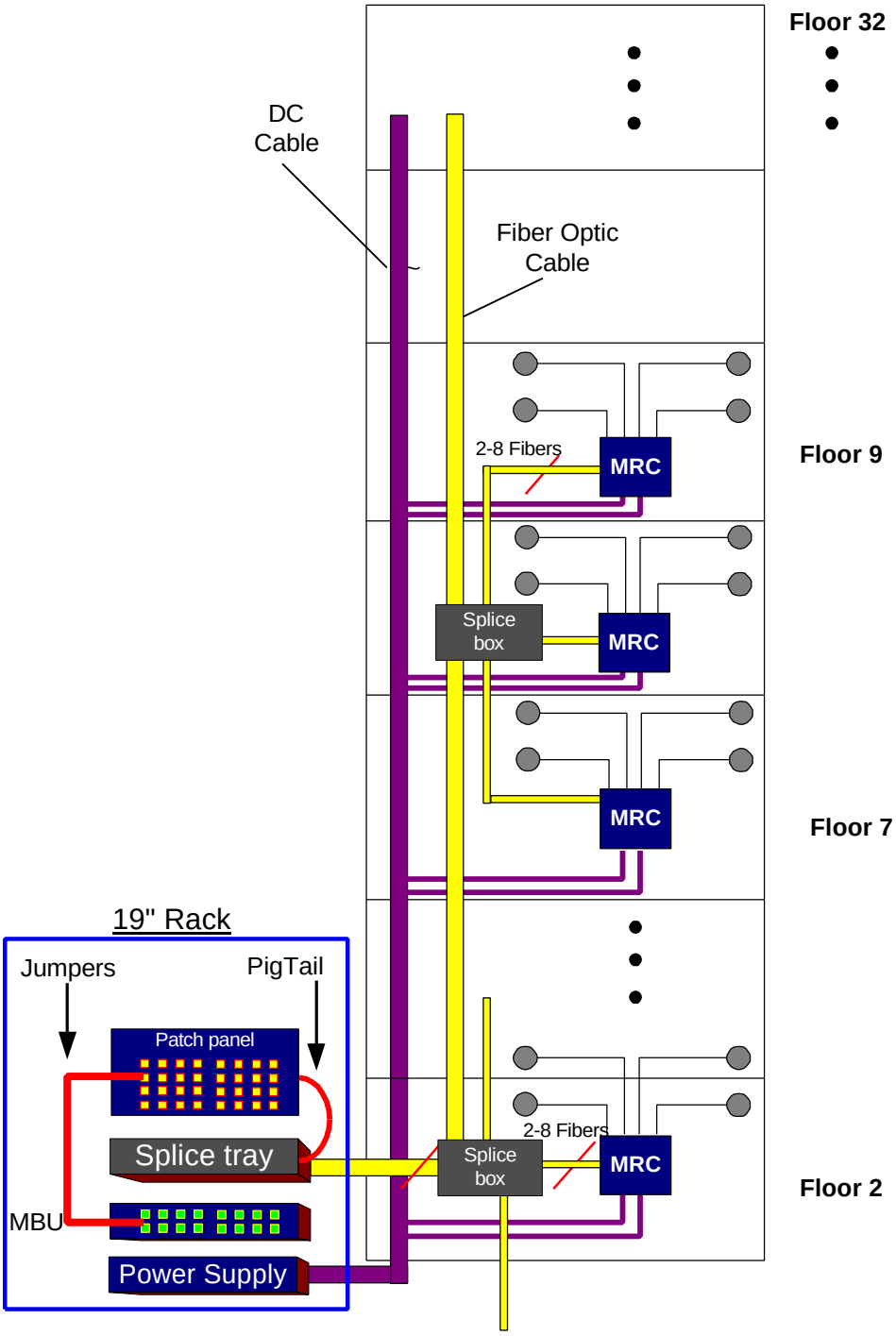
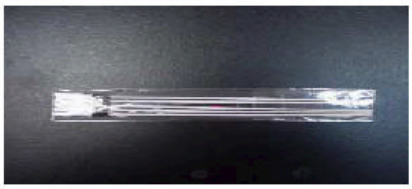


Figure 17: Example - ModuLite™ Installation (fiber and coax)

4.8.1. Fiber Optic Cable

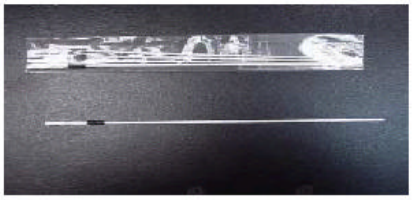
Before connecting the cable, clean the inside adaptor of the ModuLite™ according to the following instructions:

1



1. Set of cleaning rods for optical adaptor

2



2. Set of cleaning rods for optical adaptor

3

3. Open the cover of the optical connector found in the mechanical base of the product.

4

4. Insert the cleaning rod into the round hole in the adaptor and ensure that the rod comes in contact with the tip of the interior fiber.

5

5. When the rod is in contact with the tip of the interior fiber, rotate the rod clock-wise only at least three full rotations

6

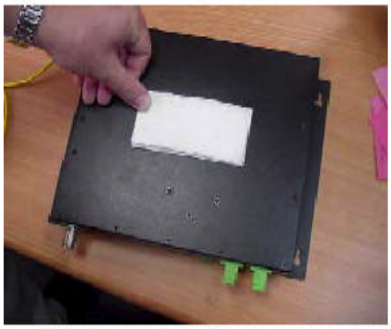
6. Remove the rod and replace the adapter cover.

Clean the connectors as follows:

1

Open the cover of the optical connector cleaning pads.

2

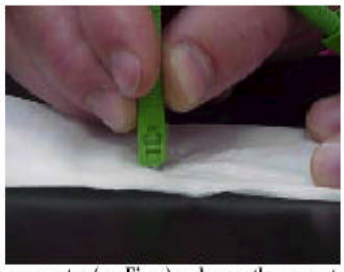


Fold a single cleaning pad. (See Figure). Place the pad on a flat surface.

3

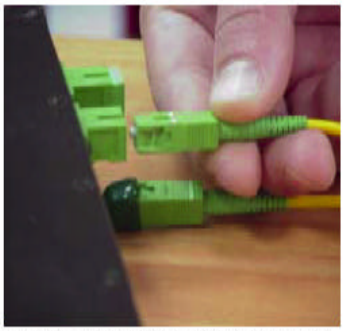
Remove the cover from the optical connector.

4



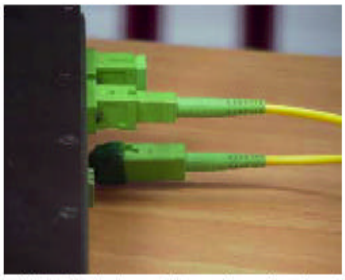
Hold a connector (see Figur) and move the connector so that the fiber head rubs against the cleaning pad. Repeat three or four times.

5



Return the connector to a cleaned optical adaptor .

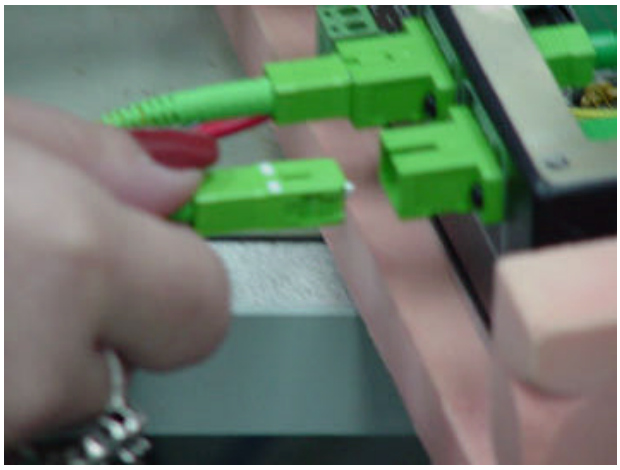
6



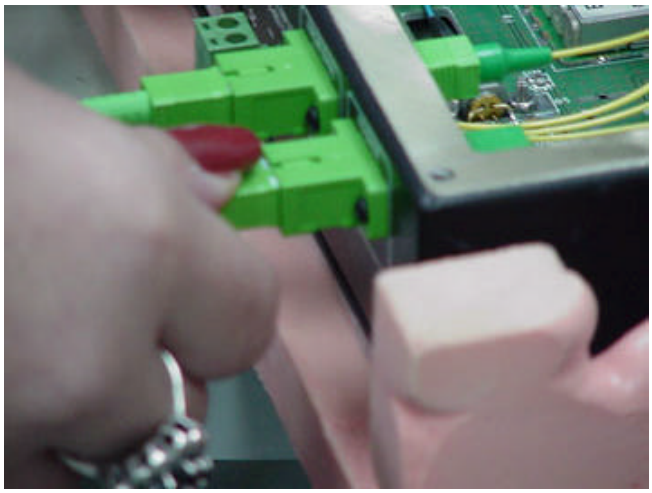
If the optical adaptor has not been cleaned, replace the protective cover on the optical connector.

To connect the cable:

- Line Up the Polarity Key.



- Insert the connector.



4.8.2. ModuLite™ Installation Parts List

The following parts are needed for setting up the ModuLite™ Base and Modular Remote Cabinets. A fiber contractor handles cable splicing in order to connect the units. The fiber contractor needs to use the parts list from Table 5 to arrange all equipment necessary for setting up and installing the ModuLite™.

Table 5: ModuLite™ Installation Parts List

The following tables refer to a full configuration 32 floor building:

Equipment	Description	Quantity	Comment
Coax cable (per 1m) according to the technology (7-8dB loss for 100m in 1000MHz)	Connect MRC to antenna.	As needed	
Antenna		As planned	
Optical cable (8*9) 72 fibers – singlemode fiber	Optic cable for short distance & protected environments (tight buffer type).	Total=500m	
Patch panel 72 cabinet with SC/APC adaptors.	Connect jumpers to base and pigtails to splice tray.	2	
Splice box	Connects optic cable from Cabinet and pigtails to MRC.	11	1 per 3 floors
Splice tray	Tray-1*50 connects cable optic and pigtails near Modular Base Unit.	4	In some cases in patch panel
9/125/3000 3m optical jumpers with SC/APC connector (simplex).	Connect patch panel to MBU.	256	
9/125/900 5m Pigtail with SC/APC connectors (B)	Connect patch panel and splice tray.	344	
9/125/3000 15m Pigtail with SC/APC connectors (R)	Connect patch panel and splice tray.	168	
Electricity cables (per 1m)	Delivers power to units.	According to length.	
Electricity ducts (per 1m)	Ducts for moving cables though building.	According to length.	If needed
Coax connectors n-type	Cable connectors	As needed	

Table 6: ModuLite™ Installation Labor List

Labor	Description	Quantity	Comment
Installing splice box + splicing fibers	Installing the box and opening fibers at MRC.	11	
Installing patch panel cabinet + splicing fibers	Installation of the box and opening fibers at MBU.	256	
Installing Foxcom Wireless equipment	Installing Modular Base Units and MRC's.	36	
Installing optic cable (per 1m)	Pull and install optic cable through building.		
Installing coax cable antennas	Install cable antennas on each floor		
Installing electricity ducts (per 1m)	Install cables through ducts in building.		If needed
Installing electricity cables	Install cables through ducts in building.		
System checking and report.	Trouble shooting and walk test.		

4.9. High Rise Installation

In a high-rise installation, all MBU's are placed in the same location. The MBU's are connected to the BTS/RBS (see BTS/RBS connection – page 44). An MRC can be located on every floor according to the RF design. The fiber optic cable runs from the MBU to every floor and terminates at the splice box located on every three floors of the building. Normally, every splice box connects three MBU's. From the splice box, the fiber optic jumpers connect to the associated MRC. From each MRC, a coax cable delivers the signal to the antenna.

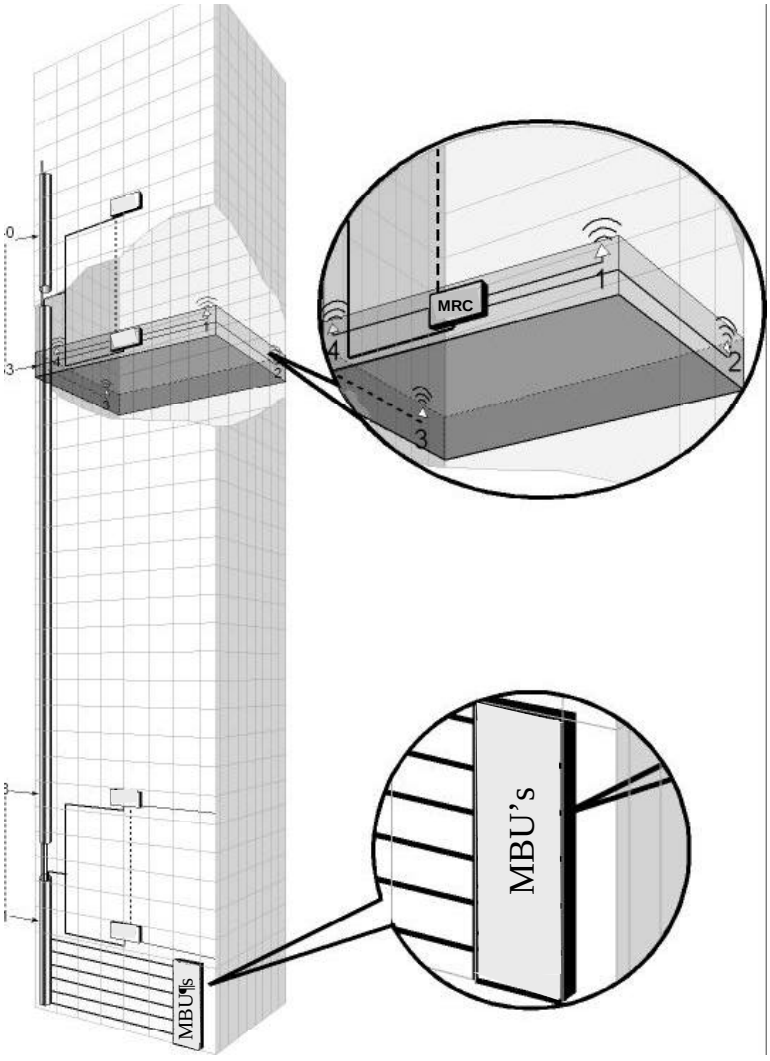


Figure 18: High Rise Installation

4.10. Horizontal Layout Installation

In a horizontal layout installation, one fiber optic cable connects the MBU to every installed MRC. The fiber optic cable terminates at a splice box located near the MRC and from the splice box connects to the associated MRC.

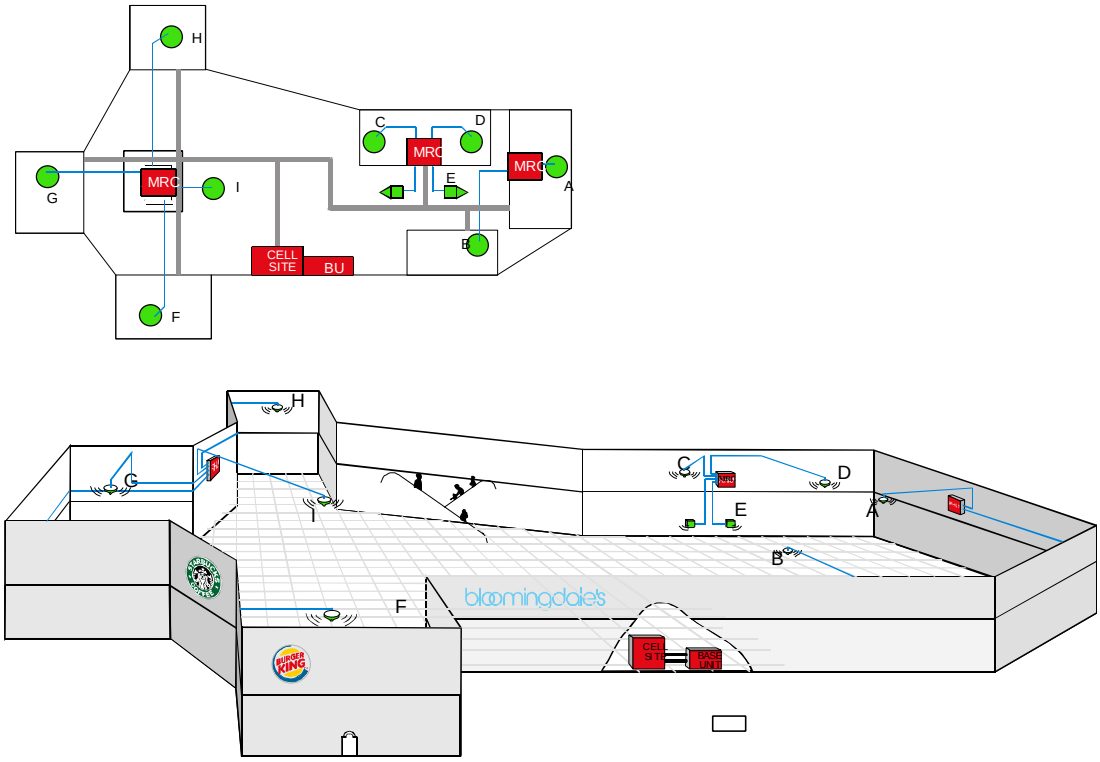


Figure 19: Horizontal Layout Installation

4.11. Wireless LAN Installation

Two products are available in the Modulite 800 Series:

Modulite 810 1 AP
Modulite 840 1-4 Ap's

Figure 20 shows the 810 module in the MRC:

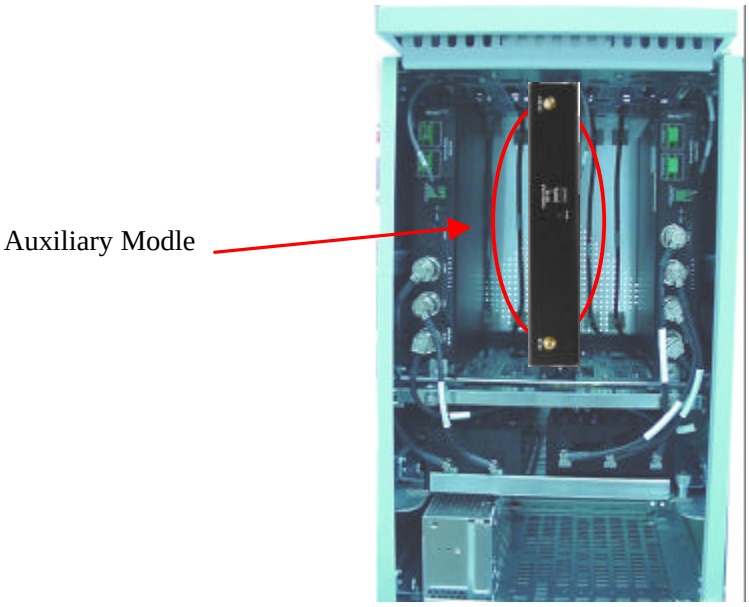


Figure 20: ModuLite™ MRC Interior with Auxiliary Modle

4.11.1. System Configuration with Modulite 810

depicts the system configuration for Wireless LAN as part of the ModuLite™ product. The Auxiliary Modle including power amplifier and power supply DC/DC that resides in the MRC cabinet. The access point module is connected via a power amplifier that is used to increase the coverage area of the access point. The power amplifier is connected to the 4*4 hybrid combiner that sums the cellular services signals together with the Wireless LAN signal and then sends the signal to four antennas. See Figure 22 for connector points from the Auxiliary Modle.

Figure 21: 802.11b Configuration

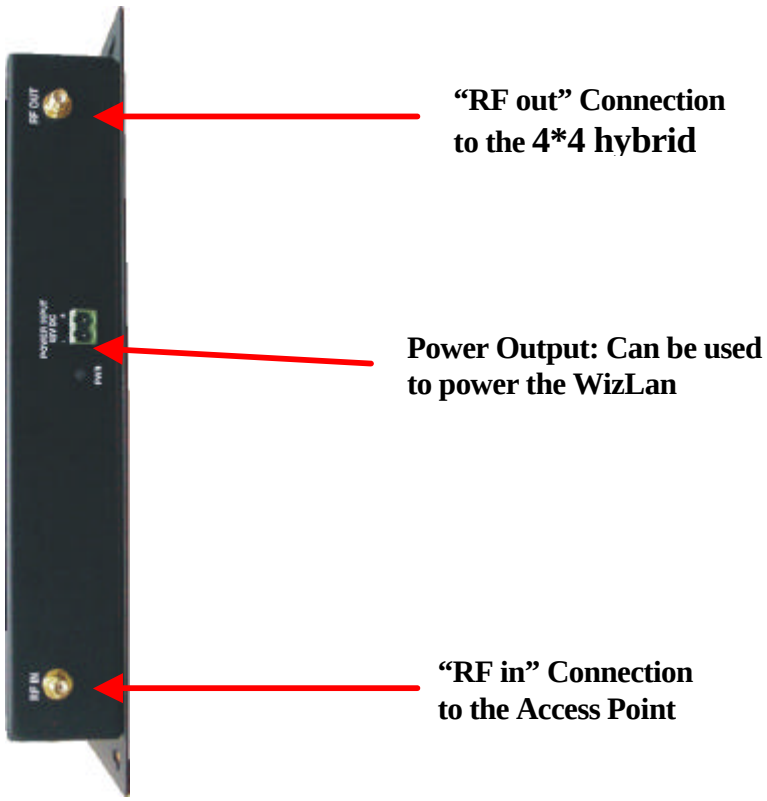


Figure 22: Connector Points on the Auxiliary Modle

4.11.2. System configuration with 840

The Modulite 840 supports 1- 4 AP¶s and is used when there is a request to support increased capacity in the same location. The following drawing describes the system configuration.

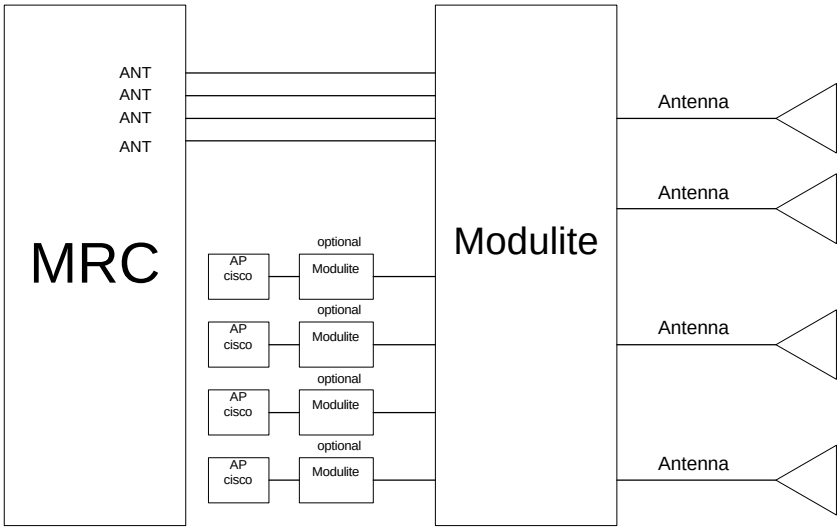


Figure 23 - system configuration with Modulite 840

The MRC antenna ports are connected to the 840 Cellular ports and are combined with the AP WLAN signal of the AP and the Modulite 810. The Modulite 810 is an optional module. The combined signal WLAN (from the AP's and the Modulite 810) and the Cellular/PCS signal from the MRC are combined together and distributed to 4 antennas.

The following table describes the configuration when a different number 1-4 AP are connected to the 840.

# of Access Points	Access point designator	Connected to Antenna
1	AP 1	1,2,3,4
2	AP1	1,2
	AP2	3,4
3	AP1	1,2
	AP2	3
	AP3	4
4	AP1	1
	AP2	2
	AP3	3
	AP4	4

Indoor Wide band Antennas

Combining the Cellular and the WLAN services requires using wide band antennas. Attached are the recommended antennas tested and approved by Foxcom Wireless.

Vendor	Catalog number	Gain [dBi]
Mars Antennas	MA-CM36-15	2 low band 3-4 high band 5 WLAN 802.11b
Celwave	A08818DC00-28T0	2.1
Antenna	ASP-3561	2

4.11.3. Connecting to the Ethernet Line

The connection to the Ethernet line can be accomplished in two different ways:

1. Via local connection, or
2. Concentrated remote location.

The local connection can be made by connecting each MRC located at each floor (in a typical configuration) to the nearest Ethernet line on the same floor. The RJ45 should be connected by cable to the nearest Ethernet line. The advantage in this configuration is that one can save on fiber installation that runs from each floor to a central location to be connected to the Ethernet.

The remote connection can be accomplished by using two WizLans (see next page). These two components are used to convert Ethernet to a fiber optic signal and vice versa.
The Ethernet signal will be converted to fiber optic signal in the amplifier module and sent via the fiber optic cables to the second converter located next to the remote Ethernet connection (located in the communication room of the building).

The following steps should be used to connecting the access point to the Ethernet:

1. The Ethernet to fiber optic converter can be mounted on the wall. Use two screws to connect the WizLAN (Ethernet to fiber optic converted) to the wall.
2. Connect the fiber optic cables to the WizLAN.
3. Connect the WizLAN to the power adapter. (AC to 5 VDC power supply.)
4. Connect the Ethernet link to the WizLAN.

Figure 24: WizLAN Converter

5. Optical and RF Connections

The following sections describe the ModuLite™ optical and RF connections.

- MBU- Modular Base Unit
- MRC- Modular Remote Cabinet

5.1. Modular Base Unit (MBU)

The MBU can be considered as main Hub connected to each specific service.
There are two set-up options for the MBU:

- BTS/RBS with one port
- BTS/RBS with two ports

5.1.1. BTS/RBS with one port

1. BTS/RBS must be connected to a duplexer (standard), via 50Ω (RG223) coax cable.
2. The downlink port is connected through attenuators to the designated input of the Modular Base Unit, according to the service and required input power.
3. When more than one ModuLite™ Base 4 Unit is used to the same service, splitters are required to connect to the other Modular Base Unit inputs from the same service.
4. The uplink from the Modular Base Unit will only combine the required ports and connected to the duplexer uplink port via 50Ω (RF 223) coax cable.
5. Connect the fiber optic cables from the Modular Base Unit to the MRC's through the patch panel cabinet.
6. Connect the power supply to the units locally or remote, according to power design planning.

Note

All Coax cables are male-to-male 50W.

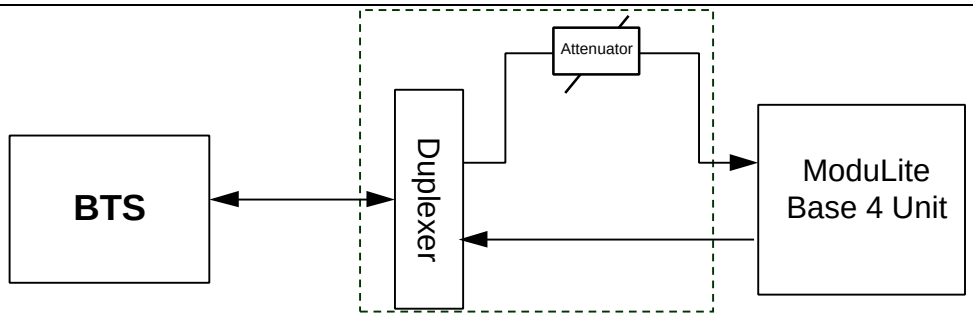


Figure 25: Example: One port BTS/RBS connected to 1 MBU 4 ports

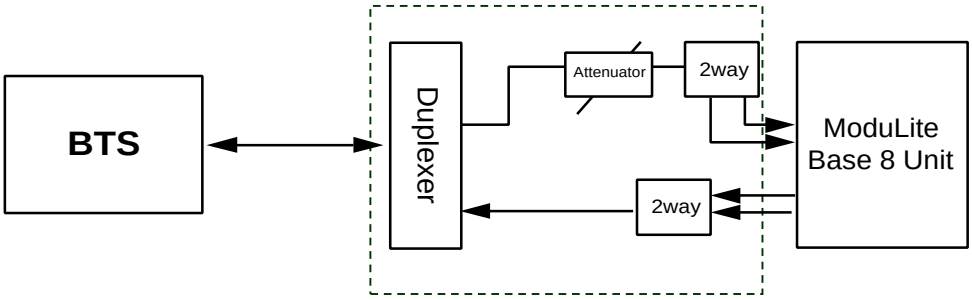


Figure 26: Example - One port BTS/RBS connected to 1 MBU 8 ports

5.1.2. BTS/RBS with two ports

1. The BTS/RBS downlink port should be connected via a 50Ω (RG223) coax cable to the corresponding Modular Base Unit input via an attenuator.
2. The downlink coax cable coming from the BTS/RBS should be split using splitters to all Modular Base Unit input ports (split according to need).
3. The input power for each Modular Base Unit should be calculated to meet the product specifications according to each service.
4. For the uplink, only necessary ports will be combined and connected to the BTS/RBS uplink port with suitable combiner. All unused ports should be terminated with 50Ω load.

Note

All cables are coax jumpers (male to male 50W).

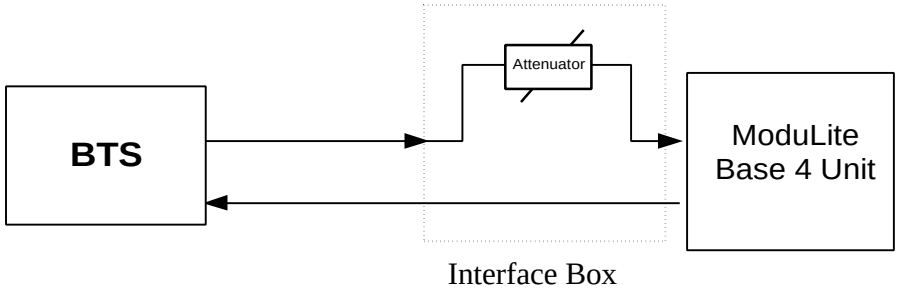
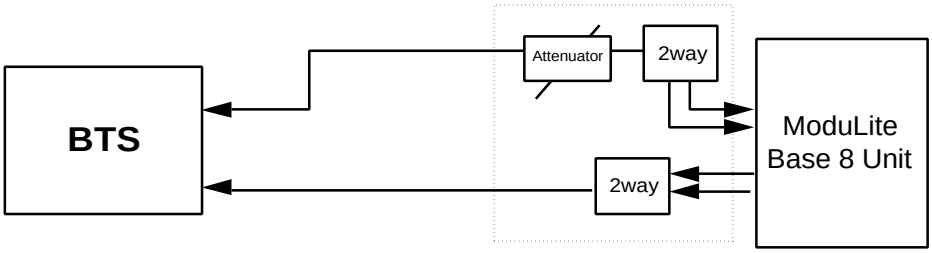


Figure 27: Example - Two port BTS/RBS connected to 1 MBU 4 ports



Interface Box

Figure 28: Example- Two port BTS/RBS connected to 1MBU 8 ports

5.2. Modular Remote Cabinet (MRC)

1. For the downlink, connect the fiber optic cable pigtails from splice box coming from the Modular Base Unit port to the corresponding Modular Remote Cabinet port (according to the service).

2. Connect the Modular Remote Cabinet to antennas according to the RF engineers design using ½" or 3/8" coax cable. (Up to four antennas per MRC).

3. For the uplink, connect the fiber optic cable pigtails from splice box from the Modular Remote Cabinet to the uplink port that connects to the Modular Base Unit corresponding to the same service.

4. Connect the power supply to each MRC according to power design planning.

6. Alarm Monitoring

The Modular Base Unit has a 25 pin D-type connector that is connected to 4 dry contact relays (MB4U). Each of the relays indicates the status of the link between the MBU and one of the MRC's. This capability provides the status of the optical communications for each service. The relay connections on the 25pin D-type connector can be connected directly to the BTS alarm relays and can be monitored from the remote end.

In order to transmit the ModuLite™ system as a "major alarm", all dry contact pins need to be connected in a serial (cascade) formation, for Normally Closed alarm. All dry contacts need to be connected in parallel formation, for Normally Open alarm.

Note

For further information contact Foxcom Wireless

Table 7: 25 Pin Alarm Pinouts

Pin	Type of Alarm	Port
1	Dry Contact 4	1
2	Dry Contact 4	2
3	Open Collector	4
4	Dry Contact 1	1
5	Dry Contact 1	2
6	Open Collector	1
7	Dry Contact 2	1
8	Dry Contact 2	2
9	Open Collector	2
10	Dry Contact 3	1
11	Dry Contact 3	2
12	Open Collector	3
13	Dry Contact 8	1
14	Dry Contact 8	2
15	Open Collector	8
16	Dry Contact 5	1
17	Dry Contact 5	2
18	Open Collector	5
19	Dry Contact 6	1
20	Dry Contact 6	2
21	Open Collector	6
22	Dry Contact 7	1
23	Dry Contact 7	2
24	Open Collector	7
25	-	-

7. Power Supply for ModuLite™

The power supplies to drive the ModuLite™ can be purchased from Foxcom Wireless. The power supplies will be installed into a rack or mounted on a wall and will provide power for both the Modular Base Units and Modular Remote Cabinets.

The example below (Figure 29) depicts a ModuLite™ system consisting of CDMA800, GSM1800, and GSM Dual Band, with 500W/ 48VDC AC/DC converters providing power for a total of 1.5A per unit.

Between the AC/DC converters and the units, a circuit breaker (maximum 10A) must be installed, either in the AC/DC converter or nearby.

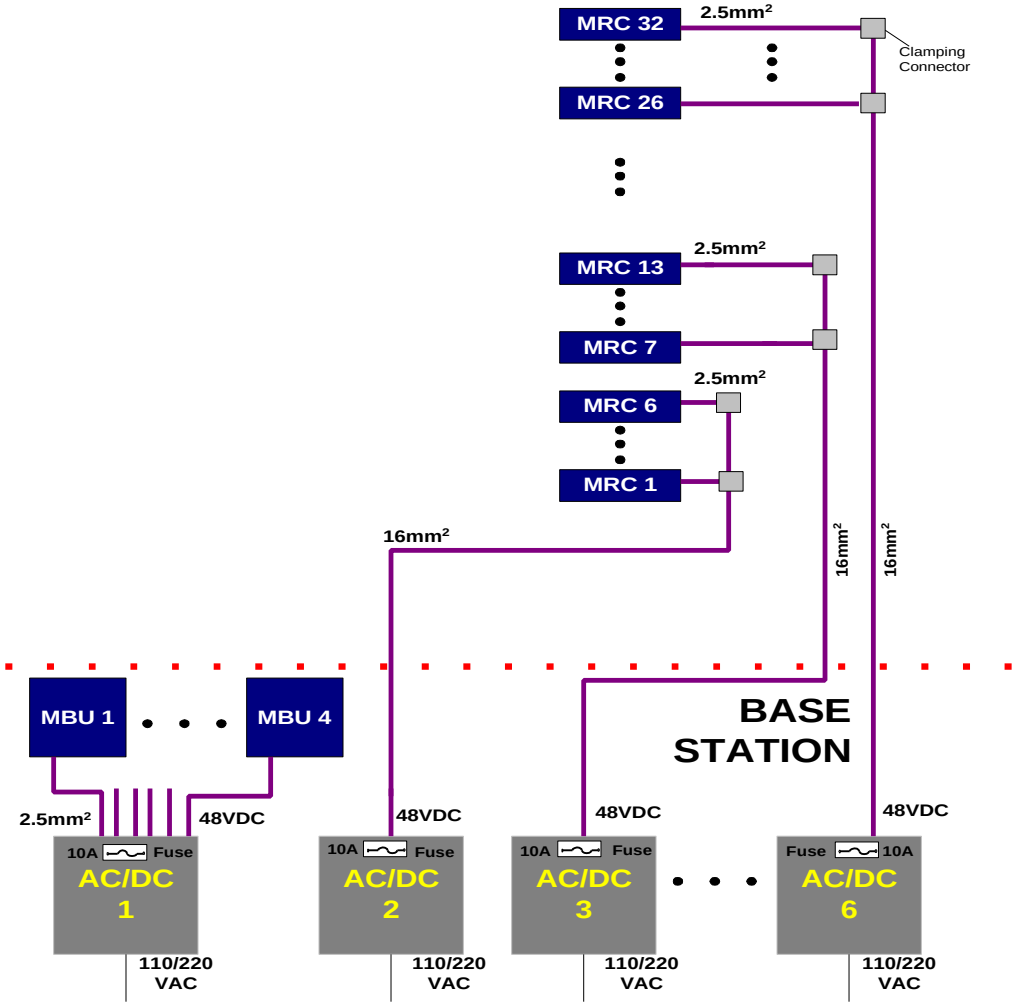


Figure 29: Example - *DC Power Supply in High Rise Installation*

The power supply that drives the ModuLite™ system can be purchased from Foxcom Wireless. Four power supply options are available.

7.1. Option One (Remote Power)

In this option the MBU is connected to the power supply via electrical cables. In order to power the MRC from the power supply, two copper electrical wires running through the building (separately from the fiber optic cables) supply power to each MRC in parallel. For this configuration, electrical power calculations need to be made. This option is shown in Figure 29.

7.2. Option Two (Local Powering)

In this option the power supply type is a standalone configuration. Power for both the MBU and MRC's will be supplied separately. In this configuration each unit will be co-located with a power supply. This will not require running long electrical cables.

7.3. Option Three (Built-In Powering)

In this option the power supply type for the MRC's is A.C. Each MRC will come with a built-in power supply source. To power the MBU's, local D.C. power will be used. This will not require running long electrical cables.

Table 8: Power Supply Options

Materials	Model
Local power supply	LPS-150-N-2A
Remote power supply (no redundancy)	RPS-200-N-48
Remote power supply (fully redundant)	RPS-150-R-48
Remote power supply (fully redundant)	RPS-500-R-48
Remote power supply (fully redundant)	RPS-1000-R-48

Note

For further information refer to Foxcom Wireless Power Supply manual and Power Supply Planning Rules.

8. Optical Test Procedure

This section describes the methods applied to test fiber optic cable's optical insertion loss and return loss.

8.1. Fiber Optic Cable Test

Due to the extended distances that analog signal transmissions travel on cable, the major challenge is to determine the status of the cable.

In order to determine that the cables are functioning, technical personnel need to perform optical power tests.

The optical power tests covered in this document are:

- Optical insertion loss measurement test
- Optical return loss measurement test

In order to explain the testing procedures, the terms related to these tests need to be explained.

8.2. Fiber Optic Cable – Terms

Fiber optic cable is produced in a variety of formats with different characteristics. The following terms define the various aspects of fiber optic cable:

- Fiber optic cable
  - Jacket
  - Buffer
  - Fiber

- Optical fiber
  - Core
  - Clad
  - Singlemode
  - Multimode

- Fiber optic connection
  - Splice
    - Fusion

Mechanical
Connector

- Bending Loss
  Minimum bending radius

- Coupler

8.2.1. Optical Fiber

Fiber optic cable is described by the amount of fibers contained within.

The cable described by the following terms:

- Glass
- Buffer
- Jacket

GLASS

Glass is the middle fiber in the cable. The data sent over the cable travels through the glass.

BUFFER

The buffer is the plastic coating that covers the fiber optic cable. The buffer protects the glass from moisture and other damage.

JACKET

The jacket covers the buffer, providing greater protection to the glass.

The fiber consists of:

- Core
- Clad

The central part of a fiber is known as the core, and the material surrounding the core is known as the clad. The clad has a lower index of refraction than the core, allowing light to be completely reflected off the surface between the core and the clad. As a result, propagated light remains entirely within the core. The cross-section of the cable is expressed as the core diameter

followed by the clad diameter. For example, a 9/125 fiber has a core diameter of 9µm and a clad diameter of 125µm.

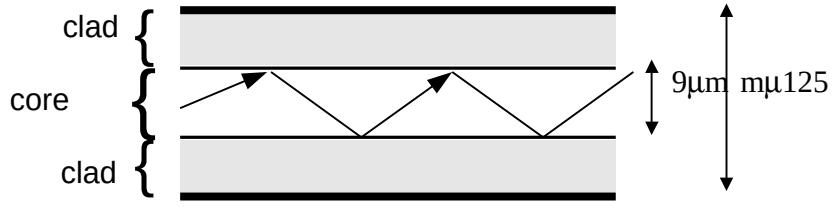
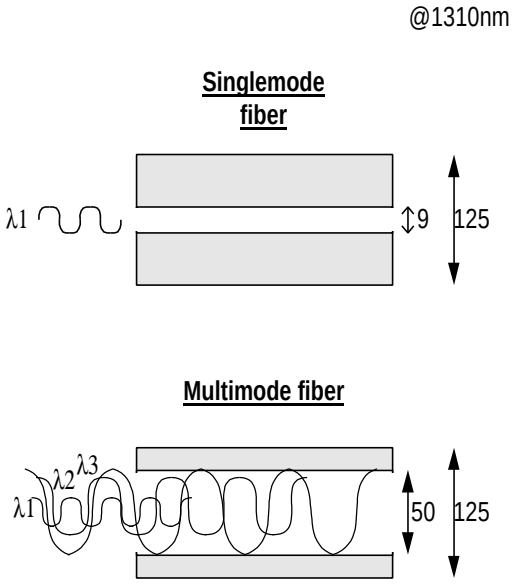


Figure 30: Fiber Optic Cable Structure

The cables are available in two different modes, each with different propagation properties:

Property	Core	Clad	Attenuation
Singlemode	9 µm	125 µm	.38 dB/Km
Multimode	50 µm	125 µm	1 dB/Km
Multimode	62.5 µm	125 µm	



(For illustration only)

Figure 31: Singlemode - Multimode Fibers

8.2.2. Connecting Fiber Optic Cable

The following are needed in order to carry out a fiber optic connection:

- Splice
- Connector

SPLICE

A splice consists of cutting the fiber optic cable across the cable's diameter and combining the opening with another fiber optic cable.

A splice can be carried out in the following methods:

Fusion – following the splice, the cables are warmed and the two fiber optic cables are melted together.
Mechanical – following the splice, a hard connection is made between the two fiber optic cables.

CONNECTOR

In order to add or connect additional fiber optic cable, a connector is used to make the connection. There are several types of connectors:

- FC/PC
- SC/PC
- **SC/APC** (used by ModuLite™)

8.2.3. Fiber Optic Cable Bending Loss

When the cable has bends or interior irregularities, then the optical signal becomes weaker, known as Bending Loss. The sharper the bend, the higher the loss. Such losses increase the cable's attenuation.

Note

When installing fiber optic cable, the minimum bending radius needs to be noted in order to prevent excessive bending of the cable, causing additional loss.

8.2.4. Coupler

Light from the cable can be split or combined, using a **Coupler**. Couplers split light with minimal loss, from one to two fibers or combine light from two fibers into a single fiber.

8.3. Foxcom Wireless System Characteristics

The ModuLite™ system consists of the following characteristics:

- Singlemode fiber
- Wavelength 1310nm
- Fiber Optic Cable Measurement Tests

Cable can be measured through several procedures. This document describes the following tests:

- Optical insertion loss measurement test
- Optical return loss measurement test

These tests are intended to be performed by technical personnel that deal with Foxcom Wireless systems. Other equipment can be used to perform these tests, however the results have to be the same as will appear in the fiber optic cable test results table (**Table 9**) at the end of this document.

The insertion loss measurement determines whether the optical signal power traveling the cable length is strong enough to be received by the photo diode, in the receiver. Following the completion of the insertion loss test, the return loss test determines the optical signal power that returns to the laser. The return power affects the laser, changing the laser's base current.

8.3.1. Test Equipment

In order to perform these tests, the following equipment is necessary:

- Light source (for wavelength 1310nm , 0dbm)
- Optical power meter
- Optical coupler (hosed and connectorized)
- Fiber optic jumper
- Adapter parts for the cable connectors

For information about equipment suppliers, contact Foxcom Wireless.

8.4. Optical Insertion Loss Measurement Test

The optical insertion loss measurement tests the attenuation of the cable. The insertion loss' value should be minimal and remain in scale to 0.4dB/Km.

The insertion loss measurement can be performed in two methods:

- Two point test
- Single point test

8.4.1. Method #1: Two Point Test

Connection description: Light source connected at one end of the cable and an optical power meter at the other end.

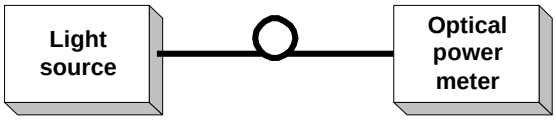


Figure 32: Two Point Test

1. Connect light source directly to the optical power meter.
2. Measure light source signal power, verifying power of 0dBm.
3. Connect light source to cable end.
4. Connect optical power meter to cable at other end.
5. Measure light source signal power using the optical power meter.
6. Calculate the difference between two signals (dB):

(Insertion loss)dB = (Light source signal at one end)dBm – (Measured signal at other end)dBm

8.4.2. Method #2: Single Point Test

Connection description: This method assumes that there are two parallel fibers on the path to be tested. Connect fiber jumper at end of the cable being tested to another parallel cable. Connect the light source, optical power meter and optical jumper as shown in Figure 33. This measurement can test two cables simultaneously.

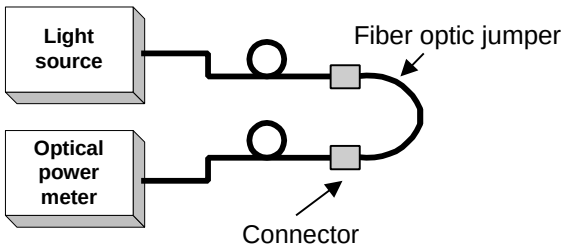


Figure 33: Single Point Test

1. Use optic jumper to connect the two cables.
2. Connect light source directly to the optical power meter.
3. Measure the power of light source signal , verify power of 0dBm.
4. Connect a light source and optical power meter to one end of each cable.
5. Measure the power of the signal.
6. Calculate the difference between the two signals in dB:

(Insertion loss)dB =(Light source signal)dBm– (Measure signal)dBm

8.4.3. Other Test Equipment

The optical insertion loss measurement test can be performed with more sophisticated measurement equipment.

For information on other types of test equipment contact Foxcom Wireless.

8.5. Optical Return Loss Measurement Test

Connection description: Connect a light source and optical power to the inputs. If the coupler has one output, connect the tested cable to this output. If the coupler has two outputs make a pigtail at the second output.

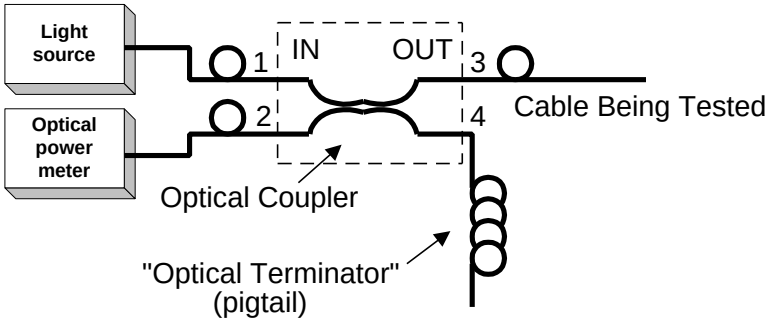


Figure 34: Optical Return Loss Measurement

8.5.1. Measurement Procedure

Measuring Power Input To Cable Being Tested

- Verify that light source power is at 0dBm.
- Connect a light source to connector #1.
- Connect optical power meter to connector #3.
- Measure signal power (P3), power should be approximately –4dBm.

Measuring Coupler Power Loss

- Move power meter from connector #3 to connector #2.
- Move light source from connector #1 to connector #3.
- Measure power loss of coupler (Lc).

Measuring Return Power

To measure return power:

- Move light source from connector #3 to connector #1.

- Connect cable being tested to output connector #3.
- If coupler has two outputs, then make a pigtail at second output.
- If cable is longer than 100 meter, then cable needs to be isolated.

***To isolate cable*:**

- Find place near test point where winding the cable into a pigtail is possible.
- Make pigtail.
- If cable is shorter than 100 meter, then verify that cable is disconnected at end.
- Measure the return light power (P2), connector #2.

Calculating Return Loss

Calculate the difference between the signals in dB.

(Return loss)dB = (P2)dBm – (P3)dBm + (Lc)dB

8.6. Results

The following table is to be filled in by technical personnel testing the fiber optic cables.

Table 9: Fiber Optic Cable Test Results

Test	Measurement	Pass Range	Pass/Fail
Optical insertion loss		<0.5 dB/Km	
Optical return loss		< -50 dB	

8.7. Summary

If the fiber fails in the optical insertion loss or optical return loss tests, then the connector needs to be cleaned. Connector cleaning is carried out according to a standard cleaning procedure. Following cleaning, the fiber needs to be tested again. If the failure continues in the fiber following cleaning, then the technical personnel need to refer to the fiber optic cable manufacturer's troubleshooting guide.

If the fiber passes the optical insertion loss and optical return loss tests, then the tested fiber optic cable is considered suitable for use with Foxcom Wireless equipment.

9. Final Test

The following checklist should be consulted when reviewing the system's setup:

- Check power supplies.
- Check that all LED's are lit.
- Carry out Walk Test, checking all antenna locations, and checking the RSSI power levels at those locations.

9.1. Modular Base Unit and Modular Remote Cabinet Connections

When the ModuLite™ is being installed the LED's on the units can verify that the optical fibers are performing correctly, and that proper connections have been made. Foxcom Wireless recommends checking the status of all connections in the ModuLite™ system in order to make sure that the installation was carried out correctly. Verification is done by checking the LED's on the Modular Base Unit and Modular Remote Cabinets. See Table 10 for an explanation of the possible optical LED performance status and how to deal with problems.

Note

When the MRC not receiving light signal from Modular Base Unit, power to laser is disconnected.

10. Maintenance / Mechanical Adjustment

- No maintenance required.
- No fine tuning required.

11. Troubleshooting

The following table should be consulted to verify proper operations of all optical connections.

Table 10: Optical LED States

Optical Out	Optical In				
Modular Base Unit Laser	**Modular Base Unit Link**	**MRC**	**State**	**Reasons**	**Troubleshooting**
+	+	+	Both units performing.		
+	-	+	Modular Base Unit sending light and Modular Base Unit not receiving signal from MRC.	1. Defective fiber connection from MRC to Modular Base Unit. 2. Failure in MRC.	1. Check connection from MRC to Base. Check fiber for break or crimp test. 2. Contact Customer Service at Foxcom Wireless.
+	-	-	MRC not receiving signal from Modular Base Unit.	Defective fiber connection from Modular Base Unit to MRC.	Check connections To MRC. Switch the cable connections, to make sure connected properly.
-	-	-	System not active.	Power not reaching any unit.	Check power connections. If LED's on, then LED'S have failed at the Modular Base Unit.

\+ Optical connection performing correctly (Optical LED lit).
\- Optical connection not performing correctly (Optical LED not lit).

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Appendix A: Link Measurements Form

To smoothly carry out link measurements, use the table that appears below. All relevant parameters are listed. This table aids system evaluation and provides necessary feedback to Foxcom Wireless.

The following issues should be taken into account:

- Measure the optical power for every link with an optical meter and light source, according to the number of links or MRC's.
- Measure the typical signal strength (RSSI) for every installed antenna.
- Check coax cable connection between MRC and every installed antenna.

Table 11: Link Measurement Table

System Link	Power Meter (mW)	RSSI (dBm)				Coax Cable (OK/Fail)			
		Ant1	Ant2	Ant3	Ant4	Ant1	Ant2	Ant3	Ant4
MRC1									
MRC2									
MRC3									
MRC4									
•									
•									
•									
•									
•									
•									

Return this form to Foxcom Wireless (fax: 972-8-918-3844).