Product Manual
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Apr/07

Preliminary - P6G

M/A-COM

VIDA Broadband

4.9 GHz Broadband Clients

MAVM-VMCLL Low Power Standard Client
MAVM-VMXCH High Power Standard Client
MAVM-VMCHH High Power Hardened Client
MAVM-VMCLH Low Power Hardened Client
MAVM-VMCHN High Power Standard Mobile Client

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MANUAL REVISION HISTORY

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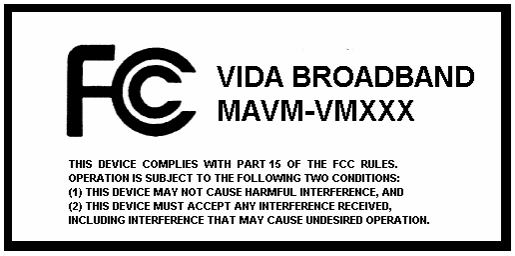

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ACKNOWLEDGEMENTS

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NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitutions of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

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1 REGULATORY AND SAFETY INFORMATION

1.1 SAFETY SYMBOL CONVENTIONS

The following conventions may be used in this manual to alert the user to general safety precautions that must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. M/A-COM, Inc. assumes no liability for the customer's failure to comply with these standards.

The WARNING symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the conditions identified are fully understood or met.

The CAUTION symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in a risk of danger, damage to the equipment, or severely degrade the equipment performance.

The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

The **ESD** symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of **E**lectro-**S**tatic **D**ischarge. Proper precautions must be taken to prevent ESD when handling circuit modules.

The electrical hazard symbol is a WARNING indicating there may be an electrical shock hazard present.

This symbol indicates the presence of a potential RF hazard.

1.2 REGULATORY APPROVALS

1.2.1 Transmitter

The transmitting devices listed below have been tested and meet the following regulatory requirements:

MODEL	DESCRIPTION	FCC ID (PART 90)	Industry Canada (RSS-119)
MAVM-VMCLL (BS-010700-001)	Low Power Standard Client	BV8VIDA-BB	3670A-VIDABB
MAVM-VMXCH (BS-010700-002)	High Power Standard Client	BV8VIDA-BB-CL	3670A-VIDABBCL
MAVM-VMCHH (BS-010700-003)	High Power Hardened Client	BV8-VIDA-BB-CL	3670A-VIDABBCL
MAVM-VMCHN (BS-010700-002)	High Power Standard Mobile Client	BV8VIDA-BB-CL	3670A-VIDABBCL
MAVM-VMCLH (BS-010700-004)	Low Power Hardened Client	BV8VIDA-BB	3670A-VIDABB

1.2.2 Receiver

This receiver associated with this transmitting device has been tested and declared to meet the regulatory requirements defined in the following sub-sections. Associated FCC labelling may be found on page 2.

1.2.2.1 FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

1.2.2.1.1 Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

1.2.2.2 Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Heath Canada's website www.hc-sc.gc.ca/rpb.

1.3 RF ENERGY EXPOSURE INFORMATION FOR MOBILE OPERATION

The FCC requires licensees and manufacturers to meet radiofrequency radiation exposure compliance as defined by FCC rule 47 CFR §2.1091 and as discussed in FCC document OET Bulletin 65: *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*.

Page 5 of OET Bulletin 65, Supplement C, subtitled: *Mobile Devices* states the following:

> "The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091. For purposes of RF exposure evaluation, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons."

Page 7 of OET Bulletin 65, Section 2, subtitled: *Guidelines for evaluating Mobile and Portable Devices* states the following:

> "Mobile devices identified in 47 CFR §2.1091 that operate at 1.5 GHz or below with an effective radiated power (ERP) of 1.5 watts or more, or those that operate at frequencies above 1.5 GHz with an ERP of 3.0 watts or more are required to perform routine environmental evaluation for RF exposure prior to equipment authorization or use; otherwise, they are categorically excluded."

The M/A-COM 4.9 GHz Broadband Client radio with 0.5 Watt RF output , installed as a mobile device using the 5.5 dBi mobile antenna and cable mounts referenced in Table 1-1, has a calculated worst case ERP of 1.78 Watts relative to an isotropic radiator (EIRP). Therefore, it can be concluded that a M/A-COM 4.9 GHz Client radio installed as a ***mobile device*** using the M/A-COM recommended mobile antenna system is ***categorically excluded*** from any requirement to perform routine environmental evaluation for RF exposure. This is true with other mobile antenna systems having gains up to 7.7 dBi.

Changes or modifications not expressly approved by M/A-COM, Inc. could void the user's authority to operate the equipment and may require the user to perform routine environmental evaluation of the mobile installation.

This two-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses RF energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, electric power, sunlight, and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which, when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All two-way radios marketed in North America are designed, manufactured, and tested to ensure they meet government established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html

http://www.osha.gov./SLTC/radiofrequencyradiation/index.html

CAUTION

Table 1-1 lists the recommended minimum lateral distance for a controlled environment and for unaware bystanders in an uncontrolled environment, from transmitting types of antennas the at rated radio power for mobile Client radios installed in a vehicle. Transmit only when unaware bystanders are at least the uncontrolled recommended minimum lateral distance away from the transmitting antenna.

Table 1-1: MPE Minimum Distance Calculation for Mobile Client Installations

4.9 GHz CLIENT WITH 0.5 WATT OUTPUT IN MOBILE OPERATION (MOUNTED IN A VEHICLE) USING THE SPECIFIED ANTENNA AND MOUNTS		RECOMMENDED MINIMUM LATERAL DISTANCE FROM TRANSMITTING ANTENNA	
ANTENNA & MOUNT	ERP (Watts)	CONTROLLED	UNCONTROLLED
Antenna: MAXRAD (B)MEFC49005HF (5.5 dBi gain) Mount: MAXRAD MHFML195C (Permanent)	< 3.0	20 cm	20 cm
Antenna: MAXRAD (B)MEFC49005HF (5.5 dBi gain) Mount: MAXRAD GMHFML195C (Magnetic)	< 3.0	20 cm	20 cm

1.3.1 Mobile Antennas

NOTE

This device must not be co-located or operated in conjunction with any other antenna or transmitter.

Install the radio's antenna (refer to Table 1-1 for applicable antenna part numbers) in the center of the vehicle's roof. These mobile antenna installation guidelines are limited to metal body motor vehicles or vehicles with appropriate ground planes. The antenna installation should additionally be in accordance with the following:

- The requirements of the antenna manufacturer/supplier included with the antenna.
- Installation instructions in this manual, including any minimum antenna cable lengths.
- The installation manual providing specific information of how to install the antennas to facilitate recommended operating distances to all potentially exposed persons.
- Use only the M/A-COM approved/supplied antenna(s) or approved replacement antenna. Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

1.3.2 Approved Accessories

This radio has been tested and meets the FCC RF guidelines when used with the M/A-COM accessories supplied or designated for use with this product. Use of other accessories may not ensure compliance with the FCC's RF exposure guidelines, and may violate FCC regulations.

For a list of M/A-COM approved accessories refer to the product manuals, M/A-COM's Products and Services Catalog, or contact M/A-COM at 1-800-528-7711.

1.4 OCCUPATIONAL SAFETY GUIDELINES AND SAFETY TRAINING INFORMATION

To ensure bodily exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use. Always adhere to the following basic guidelines:

1. The push-to-talk button should only be depressed when intending to send a voice message.
2. The radio should only be used for necessary work-related communications.
3. The radio should only be used by authorized and trained personnel. It should never be operated by children.
4. Do not attempt any unauthorized modification to the radio. Changes or modifications to the radio may cause harmful interference and/or cause it to exceed FCC RF exposure limits. Only qualified personnel should service the radio.
5. Always use M/A-COM authorized accessories (antennas, control heads, speakers/mics, etc.). Use of unauthorized accessories can cause the FCC RF exposure compliance requirements to be exceeded.

The information listed above provides the user with information needed to make him or her aware of a RF exposure, and what to do to assure that this radio operates within the FCC exposure limits of this radio.

1.5 COMMON HAZARDS

The operator of any mobile radio should be aware of certain hazards common to the operation of vehiclular radio transmissions. Possible hazards include but are not limited to:

- **Explosive Atmospheres —** Just as it is dangerous to fuel a vehicle while its motor running, be sure to turn the radio OFF while fueling the vehicle. If the radio is mounted in the trunk of the vehicle, DO NOT transport containers of fuel in the trunk.

  Areas with potentially explosive atmosphere are often, but not always, clearly marked. Turn the radio OFF when in any area with a potentially explosive atmosphere. It is rare, but not impossible that the radio or its accessories could generate sparks.

- **Interference To Vehicular Electronic Systems —** Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical of the types of electronic devices that can malfunction due to the lack of protection from radio frequency (RF) energy present when transmitting. If the vehicle contains such equipment, consult the dealer for the make of vehicle and enlist his aid in determining if such electronic circuits perform normally when the radio is transmitting.

- **Electric Blasting Caps —** To prevent accidental detonation of electric blasting caps, DO NOT use two-way radios within 1000 feet (305 meters) of blasting operations. Always obey the “Turn Off Two-Way Radios” (or equivalent) signs posted where electric blasting caps are being used. (OSHA Standard: 1926.900).

- **Radio Frequency Energy —** To prevent burns or related physical injury from radio frequency energy, do not operate the transmitter when anyone outside of the vehicle is within the minimum safe distance from the antenna as specified in Table 1-1. Refer to Section 1.2 for additional information.

- **Vehicles Powered By Liquefied Petroleum (LP) Gas —** Radio installation in vehicles powered by liquefied petroleum gas, where the LP gas container is located in the trunk or other sealed-off space within the interior of the vehicle, must conform to the National Fire Protection Association standard **NFPA 58**. This requires:
  - The space containing the radio equipment must be isolated by a seal from the space containing the LP gas container and its fittings.
  - Outside filling connections must be used for the LP gas container.
  - The LP gas container space shall be vented to the outside of the vehicle.
- **Vehicles Equipped with Airbags —** For driver and passenger safety, avoid mounting the radio or any other component above or near airbag deployment areas. In addition to driver-side and passenger-side front-impact airbags, some vehicles may also be equipped with side-impact airbags. For occupant safety, verify the location of all airbags within the vehicle before installing the radio equipment.

1.6 OPERATING RULES AND REGULATIONS

Two-way FM radio systems must be operated in accordance with the rules and regulations of the local, regional, or national government.

In the United States, the mobile radio must be operated in accordance with the rules and regulations of the Federal Communications Commission (FCC). Operators of two-way radio equipment must be thoroughly familiar with the rules that apply to the particular type of radio operation. Following these rules helps eliminate confusion, assures the most efficient use of the existing radio channels, and results in a smoothly functioning radio network.

When using a two-way radio, remember these rules:

- It is a violation of FCC rules to interrupt any distress or emergency message. The radio operates in much the same way as a telephone "party line." Therefore, always listen to make sure the channel is clear before transmitting. Emergency calls have priority over all other messages. If someone is sending an emergency message – such as reporting a fire or asking for help in an accident, do not transmit unless assistance can be offered.
- The use of profane or obscene language is prohibited by Federal law.
- It is against the law to send false call letters or false distress or emergency messages. The FCC requires keeping conversations brief and confines them to business. To save time, use coded messages whenever possible.
- Using the radio to send personal messages (except in an emergency) is a violation of FCC rules. Send only essential messages.
- It is against Federal law to repeat or otherwise make known anything overheard on the radio. Conversations between others sharing the channel must be regarded as confidential.
- The FCC requires self-identification at certain specific times by means of call letters. Refer to the rules that apply to the particular type of operation for the proper procedure.
- No changes or adjustments shall be made to the equipment except by an authorized or certified electronics technician.

Under U.S. law, operation of an unlicensed radio transmitter within the jurisdiction of the United States may be punishable by a fine of up to $10,000, imprisonment for up to two (2) years, or both.

1.7 MOBILE OPERATING TIPS

The following conditions tend to reduce the effective range of two-way radios and should be avoided whenever possible:

- • Operating the radio in areas of low terrain, or while under power lines or bridges.
- • Obstructions such as mountains and buildings.

In areas where transmission or reception is poor, communication improvement may sometimes be obtained by moving a few yards in another direction, or moving to a higher elevation.

1.8 RF ENERGY EXPOSURE INFORMATION FOR FIXED OPERATION

1.8.1 Maximum Permissible Exposure Limits

DO NOT TRANSMIT with this Client and antenna when persons are within the MAXIMUM PERMISSIBLE EXPOSURE (MPE) Radius of the antenna. The MPE Radius is the minimum distance from the antenna axis that ALL persons should maintain in order to avoid RF exposure higher than the allowable MPE level set by the FCC.

FAILURE TO OBSERVE THESE LIMITS MAY ALLOW ALL PERSONS WITHIN THE MPE RADIUS TO EXPERIENCE RF RADIATION ABSORPTION, WHICH EXCEEDS THE FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE) LIMIT. IT IS THE RESPONSIBILITY OF THE STATION LICENSEE TO ENSURE THAT THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS ARE OBSERVED AT ALL TIMES DURING STATION TRANSMISSION. THE STATION LICENSEE IS TO ENSURE THAT NO BYSTANDERS ARE WITHIN THE RADIUS LIMITS.

1.8.2 Determining MPE Radius

THE MAXIMUM PERMISSIBLE EXPOSURE RADIUS is unique for each site and is determined based on the complete installation environment (i.e. co-location, antenna type, transmit power level, etc.). Determination of the MPE distance is the responsibility of the VIDA Broadband user. Calculation of the MPE radius is required as part of the installation. The Limit for **Uncontrolled Exposure Power Density** ($\mathbf{P_d}$) is 10 W/m^2 for fixed mounted device.

The M/A-COM 4.9 GHz VIDA Broadband Client may be installed as a fixed mounted radio. After installation and commissioning, the safe distance from the 9 dBi omni-directional antenna is greater than 20 cm (8-inches).

1.8.2.1 MPE Calculation for omni-directional Antenna

This MPE Minimum Distance Calculation is based on using a 9 dBi gain omni-directional antenna mounted directly to the Client RF port.

Basic M/A-COM 4.9 GHz VIDA Broadband Client specifications:

P: Maximum Peak Conducted Power = 27 dBm

G: Maximum Omni Antenna Gain = 9 dBi

Frequency Range = 4.94 to 4.99 GHz

R: Minimum Distance between User and Antenna = 0.2 m

Equation from FCC:

$P_d = P * G_N / (4 * \pi * Rmin^2)$

$P_d = 0.5\ W * 7.94 / (4 * 3.1415926 * 0.2^2) = 7.9\ W / m^2 < 10\ W / m^2$

The calculation indicates that the minimum 0.2 meter distance between user and the omni-directional antenna (directly mounted to the Client RF port) is required when operating the M/A-COM 4.9 GHz VIDA Broadband Client.

1.8.2.2 MPE Calculation for Directional Antenna

This MPE Minimum Distance Calculation is based on using a directional antenna with more than 9 dBi antenna gain.

Basic M/A-COM 4.9 GHz VIDA Broadband Client specifications:

P: Maximum Peak Conducted Power = 27 dBm;

G: Maximum Omni Antenna Gain – Cable Loss = 27 dBi – 1 dB = 26 dBi; (Use numerical G_N value for the calculation): $G_N = 10 \wedge (G /10)$); For G = 26 dBi, $G_N = 10 \wedge (26 /10) = 398$

Frequency Range = 4.94 to 4.99 GHz;

R_{min}: Minimum Distance between user and antenna to comply with FCC MPE Level (10 W / m^2);

Equation from FCC:

$P_d = P * G_N / (4 * \pi * R_{min}^2)$

$R_{min} = SQRT(0.5 W * G_N / (4 * 3.1415926 * 10))$

R_{min} = 1.26 m, for G =26 (i.e., G_N = 398)

The calculation provides guidelines for users to estimate the minimum safe distance when a high gain antenna is connected to the M/A-COM 4.9 GHz VIDA Broadband Client. The user should always keep a safe distance from antenna greater than 20 cm or SQRT (3.9789E-3 * G_N).

The following table lists fixed installation's minimum distance for different Effective Antenna Gain Levels (Antenna Gain – Feeder Cable Loss). In all cases, the minimum safe distance defined in Table 1-2 or 0.2 meters (8 inches), whichever is greater, is the recommended minimum safe distance for fixed installations.

Table 1-2: MPE Minimum Distance Calculation for Fixed Client Installations Using High Gain Antennas

Effective Antenna Gain (dBi)	Low Power Fixed Clients (0.1 Watts)		High Power Fixed Clients (0.5 Watts)	
	Minimum Safe Distance (Meters)	Minimum Safe Distance (Feet)	Minimum Safe Distance (Meters)	Minimum Safe Distance (Feet)
<10	0.20	0.65	0.20	0.65
11	0.20	0.65	0.22	0.73
12	0.20	0.65	0.25	0.82
13	0.20	0.65	0.28	0.92
14	0.20	0.65	0.32	1.04
15	0.20	0.65	0.35	1.16
16	0.20	0.65	0.40	1.31
17	0.20	0.65	0.45	1.47
18	0.22	0.73	0.50	1.64
19	0.25	0.82	0.56	1.84
20	0.28	0.92	0.63	2.07
21	0.32	1.04	0.71	2.32
22	0.35	1.16	0.79	2.61
23	0.40	1.31	0.89	2.92
24	0.45	1.47	1.00	3.28
25	0.50	1.64	1.12	3.68
26	0.56	1.84	1.26	4.13
>26	Reduce Transmitter Power as required by FCC			

1.8.3 Safety Training Information

YOUR M/A-COM VIDA BROADBAND CLIENT GENERATES RF ELECTRO-MAGNETIC ENERGY DURING TRANSMIT MODE. THIS CLIENT IS DESIGNED FOR AND CLASSIFIED AS "OCCUPATIONAL USE ONLY" MEANING IT MUST BE USED ONLY IN THE COURSE OF EMPLOYMENT BY INDIVIDUALS AWARE OF THE HAZARDOUS RF ENERGY AND THE WAYS TO MINIMIZE EXPOSURE. THIS STATION IS NOT INTENDED FOR USE BY THE "GENERAL POPULATION" IN AN UNCONTROLLED ENVIRONMENT. IT IS THE RESPONSIBILITY OF THE LICENSEE TO ENSURE THAT THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS ARE OBSERVED AT ALL TIMES DURING TRANSMISSION. THE STATION LICENSEE IS TO ENSURE THAT NO BYSTANDERS COME WITHIN THE RADIUS OF THE LIMITS

When licensed by the FCC, this Client complies with the FCC RF exposure limits when persons are beyond the MPE radius of the antenna. In addition, your M/A-COM VIDA Broadband Client installation complies with the following Standards and Guidelines with regard to RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

FCC OET Bulletin 65 Edition 97-01 Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

American National Standards Institute (C95.1 – 1992), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

American National Standards Institute (C95.3 – 1992), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

To ensure that your exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, do not operate the station in a manner that would create an MPE distance in excess of that allowable by the FCC.

Changes or modifications not expressly approved by M/A-COM Inc. could void the user's authority to operate the equipment.

1.8.4 Contact Information

For additional information on exposure requirements or other information, contact M/A-COM, Inc. at 1-800-528-7711 or at http://www.macom-wireless.com.

2 INTRODUCTION

2.1 ABOUT THIS MANUAL

This manual is written for the communications professional responsible for installing and maintaining the VIDA Broadband Client equipment installed as part of a VIDA Broadband 4.9 GHz Broadband Network.

This manual provides an overview of the VIDA Broadband Client equipment used in the VIDA network. Equipment specifications and instructions are discussed for installing VIDA Broadband Clients and auxiliary equipment in various mobile and fixed applications.

2.2 REFERENCE MANUALS

It may be necessary to consult one or more of the following manuals. These manuals will also provide additional guidance if you encounter technical difficulties during the installation or testing process.

VIDA Broadband Base Station Installation and Configuration Manual MM-009804-001

2.3 GLOSSARY OF TERMS

The following Table is a list of terms used in this manual.

Table 2-1: Glossary of Terms

TERM	DEFINITION
AES	Advanced Encryption Standard
RSA	Rivest, Shamir, and Adleman (creators of RSA Encryption format)
DES	Digital Encryption Standard
DHCP	Dynamic Host Configuration Protocol
EDACS	Enhanced Digital Access Communications System
GPS	Global Positioning Satellite
IEEE	Institute of Electrical & Electronics Engineers
LMR	Land Mobile Radio
MIB	Management Information Base
QoS	Quality of Service
SNMP	Simple Mail Transfer Protocol
TAC	Technical Assistance Center
TFTP	Trivial File Transfer Protocol
UAS	Unified Administration System
UGS	Unsolicited Grant Services
VIDA	Voice Interoperability, Data and Access
WAN	Wide Area Network

3 SPECIFICATIONS

3.1 GENERAL HARDWARE SPECIFICATIONS

Model Numbers:

Low Power Standard Client:	MAVM-VMCLL (BS-010700-001)
High Power Standard Client:	MAVM-VMXCH (BS-010700-002)
High Power Mobile Standard Client:	MAVM-VMCHN (BS-010700-002)[1]
High Power Hardened Client:	MAVM-VMCHH (BS-010700-003)
Low Power Hardened Client:	MAVM-VMCLH (BS-010700-004)

Physical Characteristics:

Electrical Power:	
Standard Models:	11 to 30 VDC or 16 to 26 VAC
Hardened Models:	16 to 26 VDC
Power Consumption:	16 Watts maximum (8 Watts - Low Power Clients)
Size (H x W x D):	9.9 in. x 7.9 in. x 2.9 in. (25.1 cm x 20.1 cm x 7.3 cm) (Housing only, less mounting hardware and electrical connections)
Weight:	6 lbs. (2.7 kg.) (less mounting hardware)

Environmental Specifications

Operating Temperature:	-22 deg. F to +140 deg. F (-30 deg. C to +60 deg. C)
Storage Temperature:	-40 deg. F to +185 deg. F (-40 deg. C to +85 deg. C)
Environmental (Enclosure):	NEMA4
Altitude:	15,000 ft. (operational)

System Interfaces

Data Port (Client):	100Base-TX (RJ-45), Weatherproof
Data Port (Hardened Client):	LC Fiber Optic Connector, Weatherproof
Management (Service) Port:	RS232D (RJ-45), Weatherproof
4.9 GHz RF Connector:	Type-N Female, 50 ohms
AC/DC Power Input:	2-Pin, Weatherproof

[1] High Power Standard Client supplied with mobile installation kit.

3.2 GENERAL DATA SPECIFICATIONS

Security Features

Authentication:	X.509 Digital Certificate
Authorization:	RSA Public Key Encryption
Encryption:	DES, 3-DES, AES 128 bit

Network Features

Management:	SNMP
Convergence:	IPv4 over IEEE 802.3/Ethernet
	IEEE 802.3/Ethernet
Configuration:	DHCP, TFTP

PHY Characteristics

PHY:	OFDM 256 FFT
Channel Bandwidth:	5 MHz
Modulation Rates:	BPSK, QPSK (1/2, 3/4), 16QAM (1/2, 3/4), 64QAM (1/2, 3/4)
Duplexing:	Time Division Duplexing (TDD)
Frame Durations:	2.5 msec, 5 msec, 10 msec, 20 msec
CP:	1/32, 1/16, 1/8, 1/4
Throughput:	4-19 Mbps

MAC Characteristics

Duplexing:	Time Division Duplexing (TDD)
Service Classes Supported:	Real-Time Polling Service (rtPS)
	Non-Real-Time Polling Service (nrtPS)
	Unsolicited Grant Service (UGS)
	Best Efforts (BE)

3.3 TRANSMITTER

Frequency Band:	4940 - 4990 MHz
Channel Step Size:	2.5 MHz
Channel Bandwidth:	5 MHz
Frequency Stability (-30 to 60 C):	20 PPM over temperature range
Output Power into a 50 Ω Load:	
Low Power Models:	0.1 Watts (+20 dBm QPSK/16QAM)
High Power Models:	0.5 Watts (+27 dBm QPSK/16QAM)
Power Output Adjustment:	
Low Power Models:	+20 to -30 dBm (50 dB range) adjustable, 1 dB steps
High Power Models:	+27 to -23 dBm (50 dB range) adjustable, 1 dB steps
Duty Cycle:	50% Maximum (full power)
Spurious and Harmonic Emissions:	Meets or exceeds FCC Part 90
PHY:	OFDM 256 FFT
Available Modulation Mode:	BPSK, QPSK (1/2, ¾), 16QAM (1/2, ¾), 64QAM (1/2, ¾)
Duplexing:	Time Division Duplexing (TDD)
Spectrum Mask:	FCC Mask M (90.210)

3.4 RECEIVER

Frequency Band:	4940 - 4990 MHz
Channel Step Size:	2.5 MHz
Channel Bandwidth:	5 MHz
Frequency Stability:	20 PPM
Sensitivity at BER 10^{E-6}:	
BPSK -1/2:	-96 dBm
QPSK -3/4:	-91 dBm
16QAM – ¾:	-85 dBm
Max RX Input Power:	-30 dBm

4 DESCRIPTION

The VIDA Broadband Client shown in Figure 4-2 is part of M/A-COM's VIDA Broadband network. Clients are available in four configurations; High-Power Standard, High-Power Hardened, Low Power Standard and Low Power Hardened. The High Power Standard model may be installed in fixed or mobile applications. The Low Power Standard model may be installed in fixed applications. Both the High and Low Power Standard models are designed to operate from an AC or DC input voltage and utilize an Ethernet based data port configuration. The Hardened models may be installed in fixed applications, operates from a DC input voltage and incorporates a 100-BaseFX fiber Optic data port configuration for increased hardening of the unit.

The VIDA Broadband Client provides public safety grade wireless connectivity for M/A-COM's 4.9 GHz VIDA Broadband network. The open standard IEEE-based wireless broadband communications protocol of 802.16 is utilized, thereby providing true Quality-of-Service (QoS) while operating on contention-free licensed frequencies. The VIDA Broadband Client provides public safety grade end-point connectivity for M/A-COM's 4.9 GHz VIDA Broadband network. The 802.16 protocol delivers an over-the-air Data throughput from 2 to 19 Mbps. All communication over the wireless channel is scheduled by the base station, with contention slots provided for subscriber stations to request bandwidth. Up to 16 "connections" can be established between the base station and the VIDA Broadband Client, each connection having a different QoS, allowing for greater flexibility when designing a network.

Low priority processes (such as email) can be mapped to best effort services while high priority processes (such as streaming video or LMR backhaul) can be mapped to unsolicited grant services (UGS) which offer guaranteed throughput. Network convergence is provided in the form of 802.16 classifier rules that ensure network level QoS over the airlink.

Figure 4-1: VIDA Broadband Client

4.1 VIDA BROADBAND SYSTEM OVERVIEW

VIDA Broadband provides integrated public safety grade wireless broadband video and data services for mission-critical applications. VIDA Broadband combines the security of the licensed 4.9 GHz public safety frequency band with robust 802.16 industry standard to create a true public safety broadband network. With this state-of-the-art network, public safety customers can implement applications such as streaming video, web applications, economical licensed LMR backhaul, and other bandwidth intensive applications. Since the network provides guaranteed QoS, it is especially suited for applications such as video surveillance, perimeter control, and mobile command. VIDA Broadband is integrated with M/A-COM's VIDA network allowing seamless sharing of network management and administration.

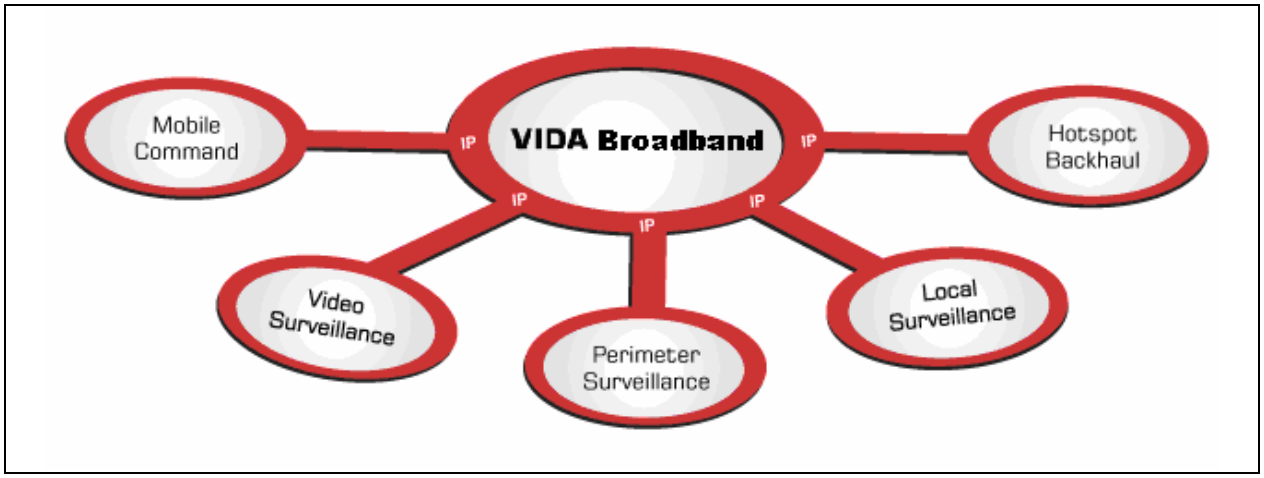


Figure 4-2: VIDA Broadband Wireless Broadband Video and Data Services

4.1.1 The VIDA Network Solution

By leveraging advances in standards-based Information Technology, M/A-COM has developed a unique IP-based network solution to solve the many challenges that confront critical communications. These challenges include delivering different types of information in a secure, reliable, near real-time environment, all the while offering the flexibility to maintain a high level of performance as technology advances.

VIDA Broadband addresses these challenges and is part of the total network VIDA solution. VIDA Broadband is fast, secure and standards based and will allow critical communications customers to obtain access to information that its users need today and into the future.

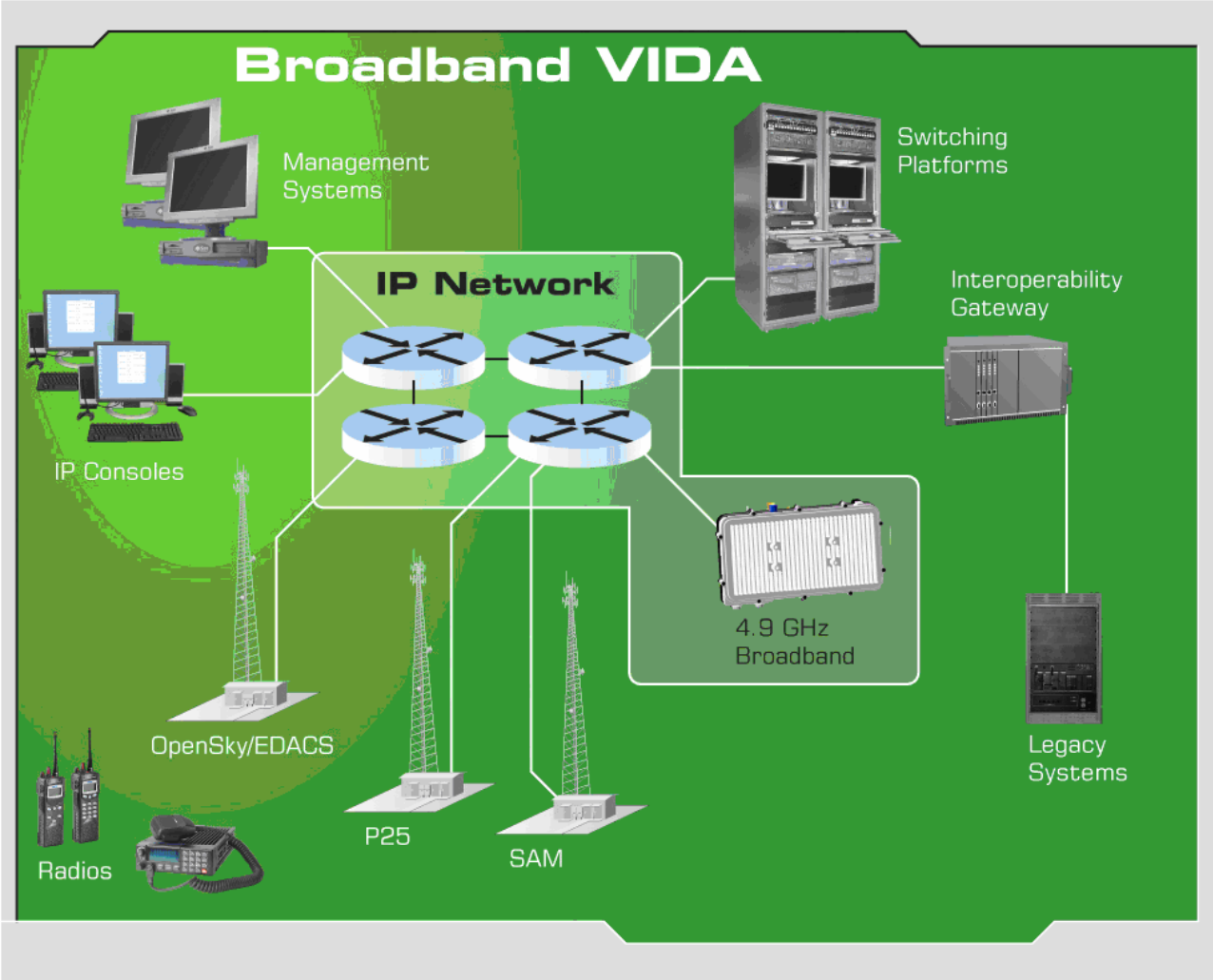


Figure 4-3: VIDA Network Solution

Figure 4-3 depicts a picture of the VIDA Network Solution and how many different communications systems are built on the solid foundation of a wide-area IP network. This provides an open architecture for the integration of public safety voice and data airlink protocols including OpenSky®, EDACS®, and P25IP. This open architecture enables mission critical communications customers to have one integrated solution to meet numerous voice and data needs.

4.1.2 The VIDA Broadband Network

VIDA Broadband is the broadband extension of VIDA and as a complete broadband distribution system, can serve as the airlink to the user, as well as a wireless extension of the core IP network upon which the VIDA network is based (Figure 4-3).

VIDA Broadband integrates the sophisticated QoS technology providing a solid security of the 802.16-2004 (WiMAX) protocol with the licensed protection of the 4.9 GHz public safety band to provide public safety grade wireless broadband data services for mission critical applications.

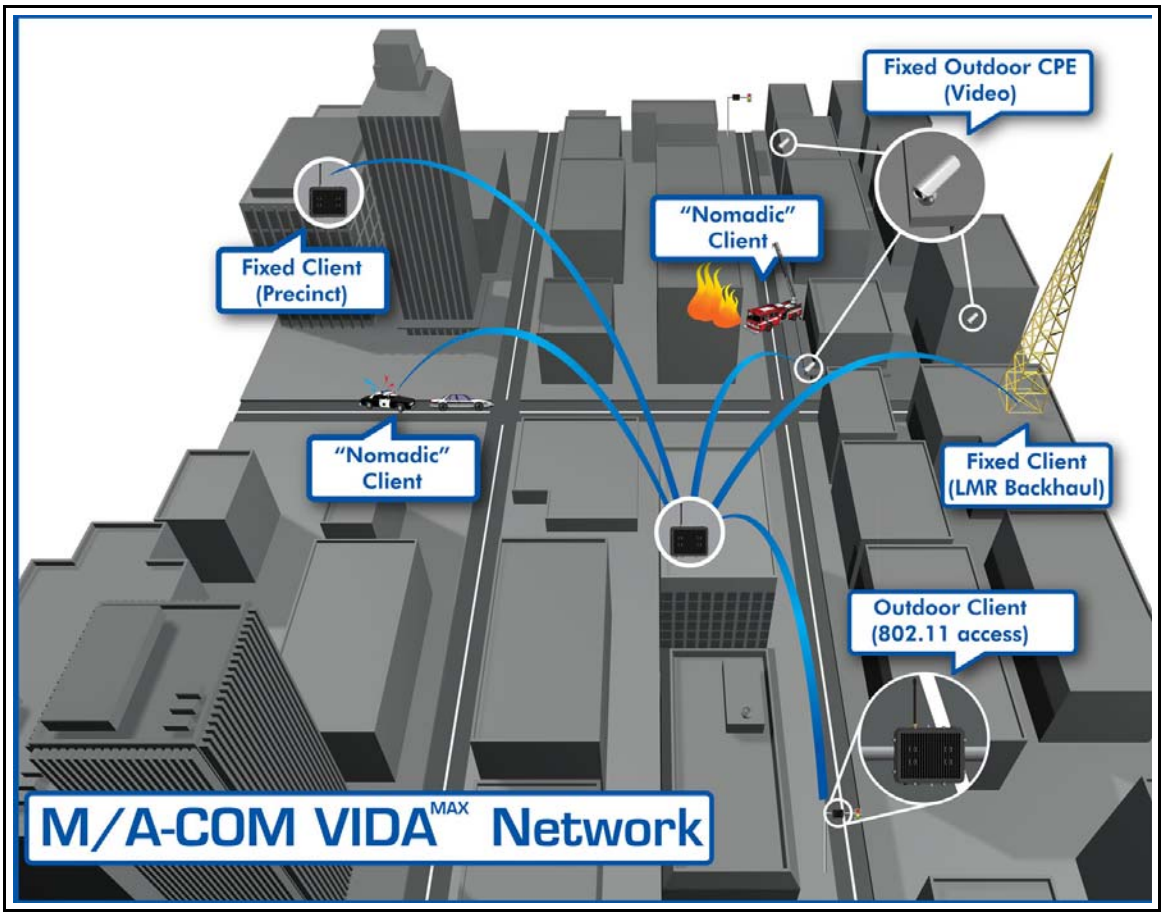


Figure 4-4: VIDA Broadband Network

Figure 4-4 illustrates a typical deployment scenario of the VIDA Broadband 4.9 GHz broadband network. It provides secure, public safety grade broadband services to both fixed and mobile clients. Conceptually, the system can be seen as extending the enterprise WAN to remote locations using the licensed 4.9 GHz public safety band. Some common applications for this system include:

- Remote surveillance video.
- Mobile broadband access to vehicles ("Hot Spots").
- Connection of remote precincts to the enterprise and/or VIDA network.
- Backhaul of IP based LMR traffic.

4.1.2.1 VIDA Broadband Network Components/Features

The basic architecture of the 4.9 GHz VIDA Broadband network is a point-to-multipoint network. A system consists of one or more base station(s) and at least one client (Figure 4-4). There are four configurations of Client devices; the Low-Power Standard, the High-Power Standard, the Low Power Hardened and the High Power Hardened Client. Standard client devices may be mounted in vehicles with omni-directional antennas or outdoors with directional antennas.

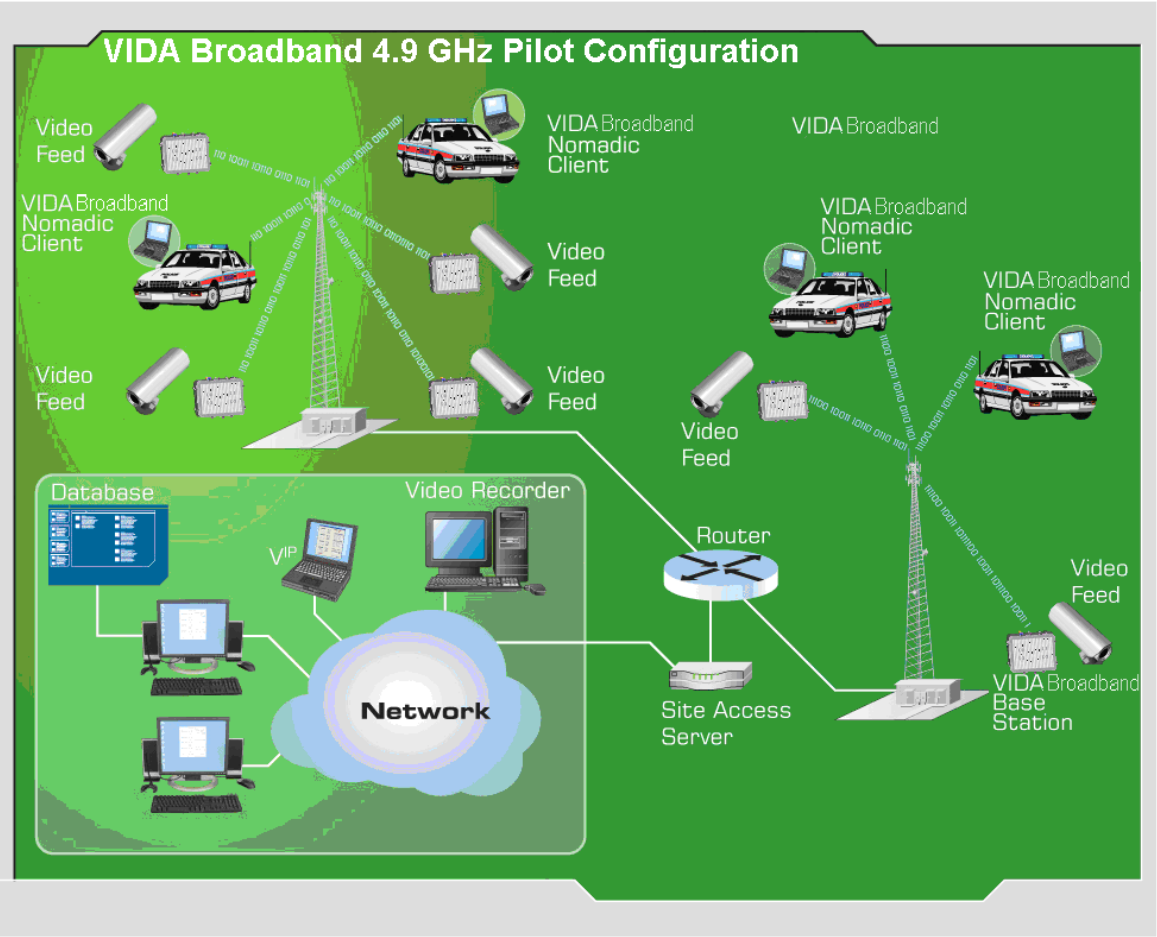


Figure 4-5: Network Diagram of Small VIDA Broadband System

The M/A-COM VIDA Broadband system implements the 802.16-2004 protocol in a 5 MHz channel, delivering an over-the-air throughput of up to 19 Mbps to associated Clients. All communication over this channel is scheduled by the base station, with contention slots provided for subscriber stations to request bandwidth. This coordinated scheduling feature of the protocol provides significant advantages such as:

- Minimizes contention between clients.
- Maximizes channel utilization.
- Maximizes ability to coordinate frequency usage among users.
- Enables guaranteed bandwidth services for critical multimedia applications.

The use of a scheduling protocol also makes the network more resilient to simple denial of service attacks that can disable other broadband networks.

To allow for great flexibility when designing a network, multiple “connections” can be established between the base station and each client, with a different QoS for each connection. Low priority processes (such as email) can be mapped to best effort services while high priority processes (such as streaming video or LMR backhaul) can be mapped to Unsolicited Grant Services (UGS) to provide guaranteed throughput.

4.2 CLIENT HARDWARE CONFIGURATIONS

The VIDA Broadband Client is housed in a ruggedized enclosure suitable for mobile or outdoor installations. The housing satisfies IP66 requirements for outdoor deployments. The Client is designed with a multiple mounting configurations to allow for mobile or fixed structure mounting. To provide for flexible RF deployment configurations, the following configurations are possible:

- Direct mounting of an omni-directional antenna onto the Client antenna port.
- Direct mounting of a directional antenna on the front face of the Client enclosure.
- Remote mounting of an antenna through the connection of an RF cable to the antenna port.

The High and Low Power Standard models are designed to operate from 11 to 30 volts AC or DC and utilize a standard RJ-45 Ethernet configuration. The Hardened models are DC input only and incorporate a 100-BaseFX fiber Optic data port configuration for increased hardening of the unit.

4.3 CLIENT AND NETWORK CONFIGURATIONS

Client configuration and management is provided via a browser interface to M/A-COM's Unified Administration System (UAS). The base station also supports localized SNMP management for single/limited site deployments. SNMP attributes are defined in the MIB II, the 802.16 and the M/A-COM using an open MIB. Base stations and the Clients may optionally be configured as DHCP and/or TFTP servers.

All Client station management can be performed over the air. The VIDA Broadband network provides strong protection against unauthorized network access through the use of certificates for Client authentication. Clients are allowed onto the network only if validated by the UAS database of recognized Clients. Once recognized, authentication keys are distributed using RSA Public Key encryption. The cryptographic methods provided by the security sub layer use DES, 3-DES, and AES algorithms.

4.4 SUMMARY OF KEY FEATURES

4.4.1 Airlink Features

The M/A-COM VIDA Broadband system implements the 802.16-2004 protocol to deliver an over-the-air throughput of up to 19 Mbps. All communication over the wireless channel is scheduled by the base station, with contention slots provided for the VIDA Broadband Client to request bandwidth. A protocol with coordinated scheduling provides significant advantages such as:

- Minimizing contention between clients.
- Maximizing channel utilization.
- Enabling guaranteed bandwidth services for critical multimedia applications.

The use of a scheduling protocol also makes the network more resilient to simple denial of service attacks that can disable other broadband networks.

Multiple "connections" can be established between the Client and a base station in the network, with different QoS for each connection, allowing for great flexibility when designing a network. Low priority processes (such as email) can be mapped to best effort services while high priority processes (such as streaming video or LMR backhaul) can be mapped to UGS which offer guaranteed throughput.

4.4.2 Network Features

Network convergence is provided in the form of 802.16 classifier rules that ensure network level QoS over the airlink.

Network management is provided via a browser interface to M/A-COM's UAS. The base station additionally supports localized SNMP management using an open MIB. Base stations may optionally be configured as DHCP and/or TFTP servers. All VIDA Broadband Client management can be performed over the air.

4.4.3 Security Features

The VIDA Broadband Client provides strong protection against unauthorized network access through the use of certificates for client authentication. Authentication keys are distributed over-the-air by the base station using RSA Public Key encryption. The cryptographic methods provided by the security sub-layer use DES, 3-DES, and AES algorithms.

4.5 VIDA BROADBAND CLIENT INTERFACE

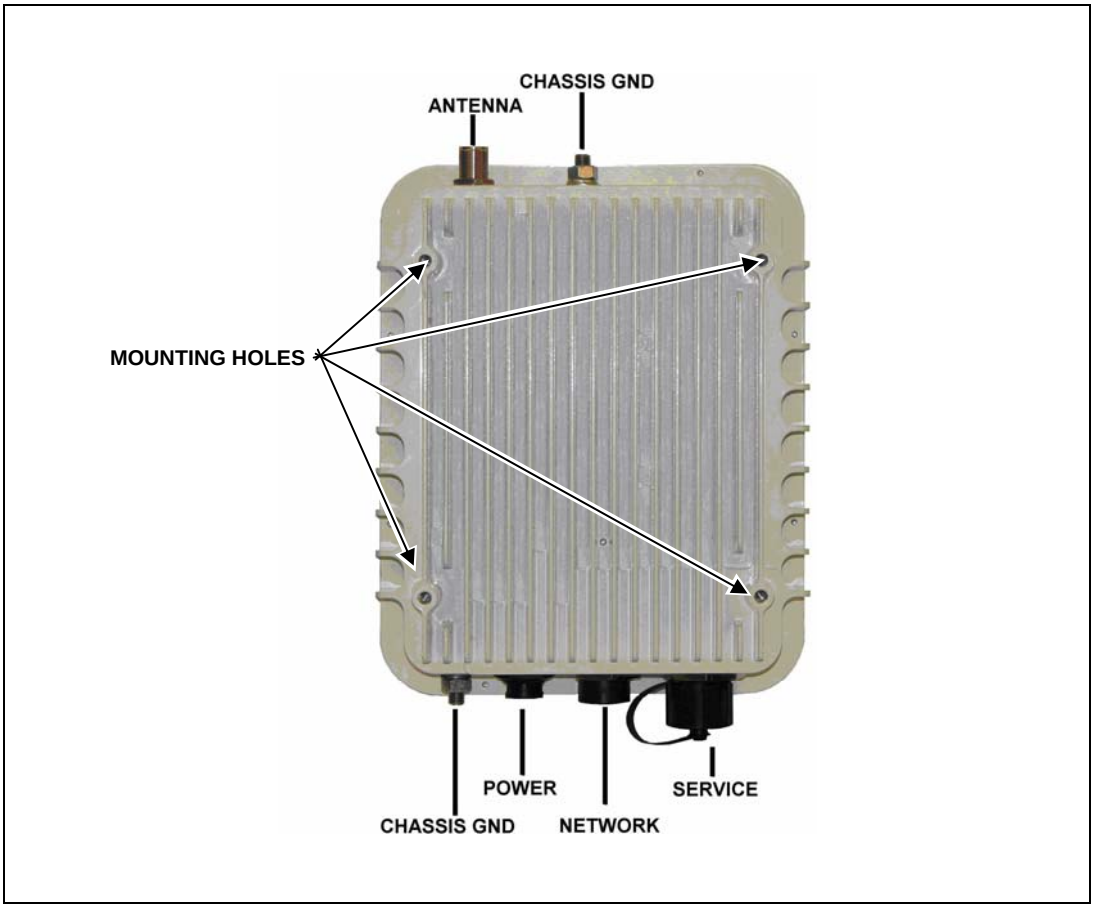


Figure 4-6: VIDA Broadband Client Interface Diagram

RF Antenna Port:

- Connector: N-type Female, 50 Ohm impedance

AC/DC Power Port:

- Industrialized 2-Pin Connector (Conxall Part No. 4180-2PG-300)

DATA Ports:

- Network Posts:
  - Fiber Optic DATA Port (Hardened Clients only)
  - 100BaseTX Ethernet (all other Client models)
- One serial data port for Service

Chassis GROUND Screw (2):

- Top mounted 5/16-18 UNC-2A Stainless Steel Screw
- Bottom mounted 5/16-18 UNC-2A Stainless Steel Screw

4.6 VIDA BROADBAND CLIENT FIXED STATION ANTENNA OPTIONS

The VIDA Broadband Client allows users to choose many different antenna types to meet their application requirements. For fixed installations, a directional antenna can significantly extend the effective range of the Client. For example, a high gain directional antenna may improve signal quality over a long distance while antennas with less gain or omni-directional may perform better in densely patterned city regions.

Three basic methods exist for mounting the base station antenna used with a Client. Two of the three methods utilize mounting positions directly to the Client and the third requires a separate mounting location and hardware. The three methods include the following:

- Directly mounting to the Client Antenna Port.
- Directly mounting to the Client Front Housing utilizing built-in mounting holes.
- Separate mounting using mounting brackets recommended by the antenna manufacturer and a short run of RF transmission line.

4.6.1 Direct Antenna mounting to the Antenna Port

Certain smaller sized lower gain omni-directional antennas may be mounted directly to the Client RF antenna port thus eliminating the need for a RF transmission line. Attention must be given to the antenna gain, physical size and wind loading characteristics when choosing the right antenna for direct mounting to the antenna port. A list of recommended antennas and their type of mounting is provided in Table 4-1.

4.6.2 Direct Antenna mounting to the Front Housing

Four mounting holes are provided for mounting an antenna to the front cover housing of the Client. These mounting holes are spaced at a 1.772” x 5.118” rectangular pattern tapped to accept 1/4-20 UNC-2B hardware with a minimum hole depth of 0.31”. Attention must be given to the antenna gain, physical size and wind loading characteristics when choosing the right antenna for direct mounting to the front housing. A list of recommended antennas and their type of mounting is provided in Table 4-1.

4.6.3 Antenna Mounting Using the Manufacturer’s Mounting Brackets

Many other industry means for mounting a directional or omni-directional antenna may used when the installation warrants separate from Client. In this case, however, the total length of cable should not exceed 5 feet. Use only high quality 50-ohm RF cable with the lowest loss possible at 5 GHz.

Basic Antenna Requirements:

Omni Antenna: Vertical Polarization

9 dBi Maximum Gain

Directional Antenna: Linear Vertical

26 dBi Maximum Gain

(Reduction of Transmitter Power is required if the Effective Maximum Antenna Gain is greater than 26 dBi.)

The following antennas have been tested and approved for use with the VIDA Broadband Client:

Table 4-1: Recommended Fixed Station Antennas*

Part Number	Manufacturer	Gain (dBi)	Polarization	Azimuth Beamwidth (Degree)	Size	Manufacturers Mount	RF Connection
MT-444003/NV	MTI	15	Vertical	120	550 x250x17 (mm^3)	MT-120019	Type N-Female
MT-466003/N	MTI	27	Vertical or Horizontal	5	600x600x51 (mm^3)	MT-120019	Type N-Female
MT-465005/N	MTI	21	Vertical or Horizontal	9	305x305x14 (mm^3)	MT-120018	Type N-Female
MT-464003/NV	MTI	15.5	Vertical	90	530x260x11 (mm^3)	MT-120019	Type N-Female
MT-464002/NV	MTI	16	Vertical	60	350x150x30	MT-120019	Type N-Female
MT-462002/N	MTI	9	Vertical	Omni	18 in. (460 mm)	Two Pole-Mount Brackets Included	Type N-Female
MFB49009/NF	MAXRAD (PCTEL)	9	Vertical	Omni	20.2 in	Wall: MMK1924 Pipe: MMK8A	Type N-Female
MP24581820PT	MAXRAD (PCTEL)	20	Vertical	9	384x353x48 (mm^3)	Indoor/Outdoor Bracket Included	12” pigtail 0.141” Semi-Rigid
MA-WA49-1X	MARS	21	Vertical	10.5	305x305x15 (mm^3)		Type N-Female

* Antenna specifications provided in this table are for general reference and subject to change without notice. Always verify current specifications with the original equipment manufacturers.

4.7 VIDA BROADBAND CLIENT MOBILE STATION ANTENNA OPTIONS

For mobile applications, both permanently installed and magnetic antenna mounts are available. Careful consideration of the type of mobile installation will help determine which mount is most appropriate for a specific installation.

Table 1-1 lists the antenna and mounts recommended for mobile installations. The MAXRAD model (B)MEFC49005HF, 5.5 dBi gain antenna is available and may be mounted using either the MAXRAD MHFML195C permanent mount or the GMHFML195C magnetic mount.

5 UNPACKING AND CHECKING EQUIPMENT

Before unpacking, installing or operating the VIDA Broadband equipment, read this section of the manual thoroughly. It contains detailed unpacking and handling instructions, and safety precautions to protect users and equipment.

5.1 UNPACKING EQUIPMENT

The VIDA Broadband equipment may be shipped in separate transit packages. The associated cabling and accessories for each unit, if any, may also be shipped in separate containers.

When unpacking the equipment, check the contents against the packing list. Contact your M/A-COM VIDA Broadband equipment representative and the carrier if any discrepancies are noted.

Save the shipping cartons and packing materials in case the equipment needs to be shipped back to the M/A-COM for service.

There are no user serviceable components within the VIDA Broadband radio equipment assemblies. These assemblies contain ESD sensitive components and should only be serviced by M/A-COM qualified personnel.

5.2 INSPECTING AND INVENTORYING EQUIPMENT

Carefully unpack the equipment and examine each item. If there is any damage to the equipment, contact the carrier immediately and have their representative verify the damage. If you fail to report the shipping damages immediately, you may forfeit any claim against the carrier.

After removal from the carton, examine the VIDA Broadband equipment for broken, damaged, loose, or missing parts. Examine the RF connector(s), circular power connector and ground lug for cracks, bent or damaged threads, or damage to any paint or seals. If any are noted, contact the M/A-COM Customer Resource Center immediately. Any unauthorized attempts to repair or modify this equipment will void the warranty and could create a safety hazard.

6 PLANNING A FIXED STATION INSTALLATION

Careful planning a preparation of any installation will always benefit the end result. Follow these simple recommendations when planning your installation:

1. Always read and follow all installation instructions, local and national building and electrical codes, and general safety rules.
2. Before beginning the installation, collect information from the Site Deployment Order (SDO) specific to the site access such as:
    - Permission to access the site.
    - Important contact names and telephone numbers.
    - Location of and directions to the site.
    - Keys and/or lock combinations to access the site and equipment shelter (if any), or points of contact to obtain them.
    - Site entry alarm system pass-codes and/or disable keys.
    - Information about work practices needed to work safely at the site.
3. Other important information that may or may not be included on the SDO includes:
    - Type of mounting—metal pole, wooden pole, tower base, exterior wall, etc.
    - Drawing or description of each site showing how the equipment is to be installed.
    - Applicable inspections completed (pole installation, electrical, local build code, etc.).
4. When necessary, pre-stage a site installation to become familiar with the specific hardware and cabling, tooling and supplies that are needed to complete the installation.

6.1 SITE EVALUATION

Before installing the VIDA Broadband Client, the System Engineer and installer should plan the site installation. Since higher RF frequencies do not readily pass through trees or buildings, consideration should be given to the following:

- Ensure there are no obstructions (such as buildings or trees) in the radio path between base station and client units.
- Ensure the any future building construction or tree growth will not obstruct the radio path.
- Ensure there is sufficient clearance around the Fresnel Zone so there is minimal interference from obstacles along the radio propagation path.
- Ensure the installation adheres to any local and national building codes and permits.
- Ensure sufficient electrical power is available at the installation site.
- When using directional antennas, align the antenna to maximize the received signal strength indication (RSSI) from the base station.
- Ensure the area around an omni-directional antenna is clear (at least 30 inches) so as not to distort the RF pattern.

- Locate the Client away from any sources of interference that could degrade the performance of the equipment.
- Ensure the base station and clients are within each other's maximum RF coverage range.
- Maximum standard CAT-5 cable length connecting the Client to the Ethernet LAN is 100 meters and maximum antenna cable length is 5-feet.

6.2 POLE-MOUNT INSTALLATIONS

The VIDA Broadband Client is designed to accommodate pole mounting. Pole mounting a Client may include mounting the unit onto a horizontally suspended light post or side arm, or a vertical telephone pole, mast pipe or tower leg. The basic example of each mounting method is depicted in Figure 6-1.

An optional kit containing two mounting brackets and hardware for attaching the Client to a pole may be purchased. The optional mounting brackets accommodate pole diameters from one (1) to six (6) inches. The installer must provide straps necessary to secure the Client brackets to the pole.

CAUTION

When mounting the Client on a pole, the installer must ensure the mounting bands are secure and resistance movement or rotation.

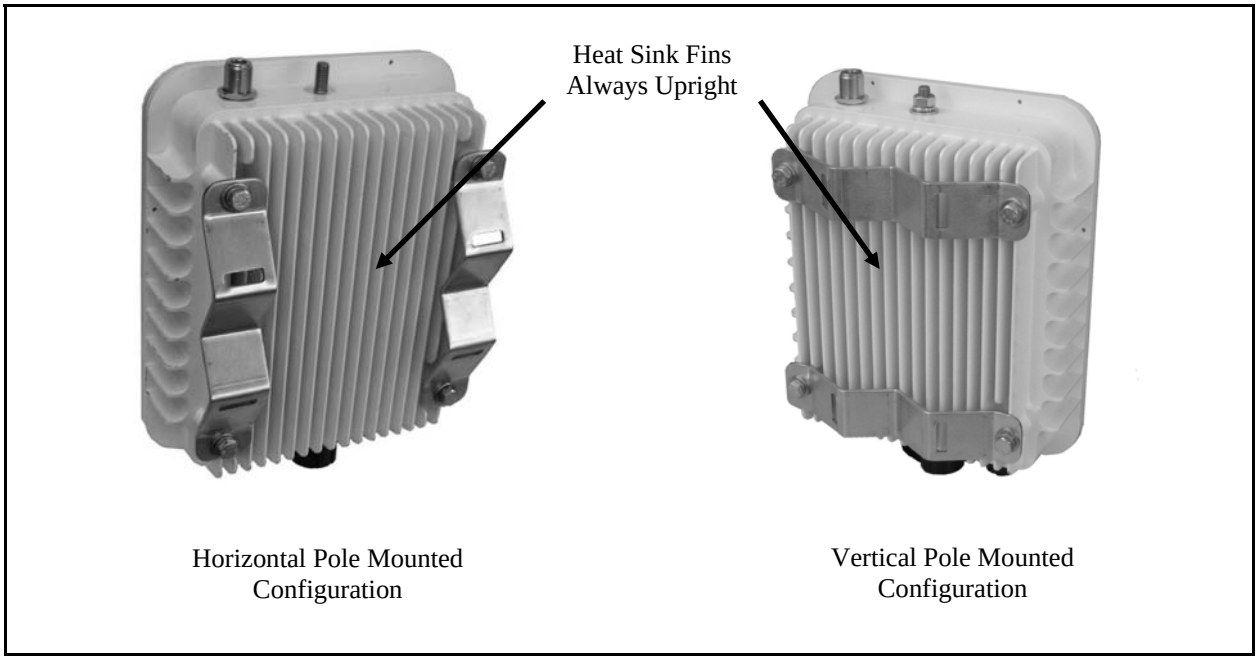


Figure 6-1: Mounting the VIDA Broadband Client

6.3 ELECTRICAL POWER

The Hardened Client requires a DC input power source while the Standard Client is capable of either AC or DC power input configurations (see Table 7-1 and Table 2-1). The input voltage source can be from 11 to 30 volts DC or 16 to 26 VAC. Careful consideration should be given regarding the voltage drop across the selected power cabling to maintain the input power requirements. If a backup power source is

desired, it must be provided by an external backup power source. Refer to Section 2, *Specifications* for additional information.

The Hardened Clients require a DC input power source. DO NOT apply an AC power source to a Hardened Client.

6.4 SITE GROUNDING

Installers should review the recommended grounding procedures in the M/A-COM *Site Grounding and Lightning Protection Guidelines manual, AE/LZT 123 4618/1* and ensure a suitable ground is installed between the station ground lug and earth ground. Grounding must also be in compliance with any local and national electrical codes.

7 INSTALLING A FIXED STATION CLIENT

NOTE

Become familiar with the hardware and electrical components of the system before attempting installation. Read and follow the installation instructions found in this manual and all other user and installation instructions for associated hardware. If any questions arise that are not answered in this or any other supplied instructions, contact the M/A-COM Technical Assistance Center for assistance.

This section provides general information regarding installation of the VIDA Broadband Client in fixed station configurations. For best results, the Client should be installed by one of the many M/A-COM Authorized Service Centers located throughout the United States. Their experienced service personnel can provide a proper radio installation and make any final adjustments that may be needed.

This manual attempts to cover the most common installation requirements for the Client. However, variations in sites may require pre-planning to reduce installation time and improve the overall professionalism of the installation. When necessary, pre-stage a site installation to become familiar with specific hardware and cabling requirements, tooling and supplies that are needed to complete the installation.

The VIDA Broadband Client resides in a Die Casting Metal Chassis to meet tough environmental conditions. The user can choose different antenna types (omni-directional or directional) depending on the application. It is preferred that the user specifies 50-Ohm low loss cable capable of operating at 5 GHz and having a maximum length of 5-feet between the antenna connector and antenna port on the Client to avoid further loss of RF power.

The Standard Client is designed to operate from AC or DC while the Hardened Client is DC input only. Total power consumption for High Power Clients is less than 16 Watts. Total power consumption for Low Power Clients is less than 8 Watts. The Client uses a weatherproof connector for the RJ45 and Fiber Optic DATA connections and for the AC/DC connector. External protection devices for lightning and power surges should be installed in-line with the antenna ports, power ports and Ethernet connections on all configurations except the hardened models (built in).

Also, M/A-COM recommends using a DC power source for all installations where the VIDA Broadband Client may experience the effects of frequent thunderstorms. Using a DC power source may provide extra isolation from lightning surges that are usually induced through AC power transformers when connected directly to the AC power mains. Also, the Hardened models offer greater protection through the use of built-in surge protection devices and Fiber Optic connectivity. Always follow all local and national electrical and building codes when installing surge protection devices.

NOTE

Both the RJ-45 and AC/DC power connectors achieve weatherproof properties only when properly mated with approved cabling. The dust cap provided for the RJ45 Service Port should be installed at all times during normal operation.

7.1 TOOLS AND TEST EQUIPMENT REQUIRED

The following tools and test equipment are recommended for installing and testing the Client:

- Common hand tools, including screwdrivers, wire cutters, pliers, open and box end wrenches, etc.
- Modular Plug Tool, 3-231652-0 (Tyco/Electronics-AMP).
  Includes; Hand Tool, 2-231652-0 and Die Set, 1-853400-0.

- Digital Voltmeter (DVM), capable of measuring AC and DC voltage.

7.2 CUSTOMER SUPPLIED MATERIALS

The customer or designated installer must provide the following:

- Ethernet or fiber optic Cable, length as required, Ethernet cable not to exceed 100 ft. (refer to Section 11.1.1 for cable specifications).
- RF coaxial cable (directional or remotely mounted antenna), i.e. LMR-400 Low loss coaxial cable.
- Pole mounting straps, i.e. Band-It® bands and buckles.
- Power source (Standard models: 11 to 30 volts AC or DC, Hardened models: DC only, 16 watts maximum AC or DC input power).

7.3 MOUNTING THE CLIENT FOR FIXED OPERATION

As shown in Figure 6-1, pole-mounting brackets can be installed onto the mounting surface of the Client so it may be mounted horizontally, such as on the arm of a light post, the side of a mast pole or the leg of a tower or other vertical post. In both cases, two metal straps (not included) are inserted into slots on the brackets and tightened to the pole using industrial grade strapping equipment.

It is important to mount the Client so that its heat sink fins are positioned vertically, as shown in Figure 6-1. This gives the Client the best thermal performance, allowing air to move naturally through the fins.

Mounting the Client with the fins vertically also allows the RF antenna port to be in the best position for mounting an omni-directional antenna, as shown in Figure 6-1.

7.3.1 Attaching the Mounting Brackets

1. Orient the brackets so when the Client is mounted on a pole, the heat sink fins are vertical. This position provides the best thermal convection (vertical fins) and shields the multiple connectors from rain.
2. Attach mounting brackets to Client using the flat washer, lock washer, and hex head bolt included with the brackets. (Ensure that the lock washer is closest to the bolt's head followed by the flat washer positioned next to the mounting bracket.)
3. The preferable mounting scheme is to have omni-directional antenna pointing straight up.

7.3.2 Attaching the Client to a Pole

1. Strap the Client to pole using Band-It bands and buckles (not supplied). Follow the manufacturer's guidelines for proper band installation techniques.
2. After installation, check the overall unit for stability and verify that the unit is not loose fitting.

7.4 POWER CABLES

Power is supplied to the Client through a 2-pin connector. Both AC and DC input power uses the same power connector. The mating connector is Conxall Multi-Con-X 2-pin connector #4180-2SG-300).

7.4.1 Power Connection

The High and Low Power Standard models require 11 to 30 VDC or 16 to 26 VAC. Hardened models are "DC Only" and must NOT be connected to an AC voltage source.

1. Connect the supply voltage per the pin out shown in Table 7-1 (AC) or Table 7-2 (DC):

Table 7-1: Power Connector Pin Configuration for AC Voltage Sources

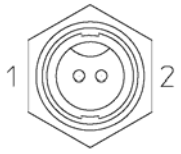
Connection	Pin	Wire Color	Power Connector (Front View of Client)
16 to 26 VAC HOT (Leg 1)	1	Black	
Neutral	2	White/Grey	

Table 7-2: Power Connector Pin Configuration for DC Voltage Sources

Connection	Pin	Wire Color	Power Connector (Front View of Client)
+11 to +30 VDC (PWR+)	1	Red	
Return (PWR-)	2	Black	

7.5 GROUNDING STUDS

Mounting studs for grounding the Client are located on two sides of the Client. For safety purposes, earth ground and lightning protection connections should be made as required using either ground stud location. Further, use only one ground stud in an installation to prevent unwanted ground paths through the housing.

7.6 NETWORK/DATA CONNECTION

The Client connects to the network using either a standard Ethernet RJ-45 protocol or Fiber optic connection. All DATA connectors are industrial grade, rugged, UV rated, weatherproof, dustproof and made for use in extreme electrical and climatic conditions. Each connector meets IP67 industrial standard for weatherproof and dustproof electrical connections.

Use the following mating connectors for the VIDA Broadband Client:

- Tyco/Electronics, Industrial Circular Ethernet Connector
  Part number: 1738607-2

- Tyco/Electronics, LC multimode fiber optic connector
  Part number: 1828618-1

The service port has a dust cap which is normally installed to provide sealing when not in use. Sealing of all other ports on the Client is provided through mandatory usage connections.

7.7 ANTENNA CONNECTIONS

WARNING

See Section 1.8 for further information regarding Maximum Permissible Exposure (MPE) limits of RF radiation set by the FCC.

The omni-directional antenna should be mounted vertically directly onto the antenna port. There is also a mounting feature on the Client to support the mounting a directional antenna.

7.7.1 Installing an Omni-directional Antenna

An omni-directional antenna may be mounted directly to the Client using the following procedure:

1. Connect an N-type male to male RF adapter (not included) to the omni-directional antenna. Hand tighten the connector.

   All cables and connectors must be capable of passing frequencies up to 5.2 GHz with minimal loss. Total cable length should not exceed 5 feet to further reduce loss characteristics.

2. For non-hardened Clients, external lightning protection is required to provide maximum protection to the site. Connect the optional lightning suppressor to the antenna assembly as shown in Figure 7-1.

   Recommend using M/A-COM # PT-009560.

3. Connect the completed antenna assembly to the Client antenna connector.

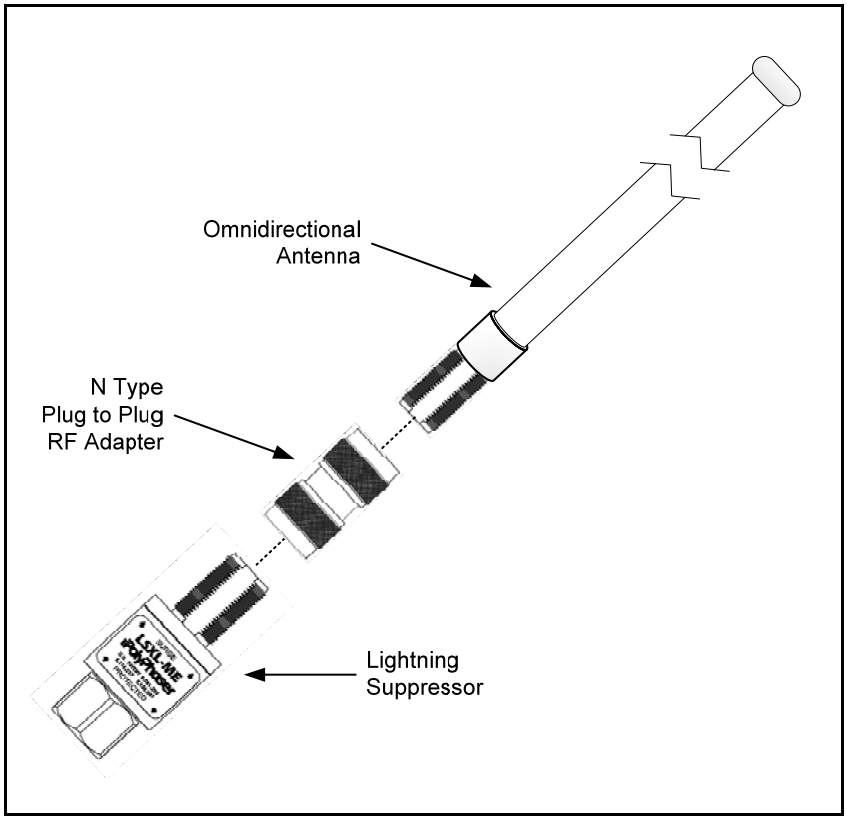


Figure 7-1: VIDA Broadband Client Antenna with External Lightning Protection

7.7.2 Installing a Directional Antenna

The directional antenna can be mounted on the Client using the universal mounting bracket. This mounting bracket is located on the antenna mounting face (cover) of the Client. The universal mounting bracket can then be adjusted to point the forward beam pattern of the antenna in the direction needed for network connectivity.

A low loss RF cable (not included) is needed to connect between the Client antenna connector and the Directional Antenna. We recommend selecting an RF cable with <1dB loss at 5 GHz. and not more than five (5) feet long.

To mount the directional antenna to the Client:

1. Using the four bolts, lock washers and flat washers included in the optional antenna mounting kit, attach the universal antenna mounting bracket to the Client as shown in Figure 7-2.
2. Attach the antenna panel bracket assembly to the antenna panel.
3. Attach the two bracket assemblies together with the universal knuckle.
4. Attach the short RF cable between the antenna and the Client antenna port.

   Recommend using < 5 ft. long LMR-400 Low loss coaxial cable with field installable N Type Male connectors, M/A-COM # MAMROS0095.

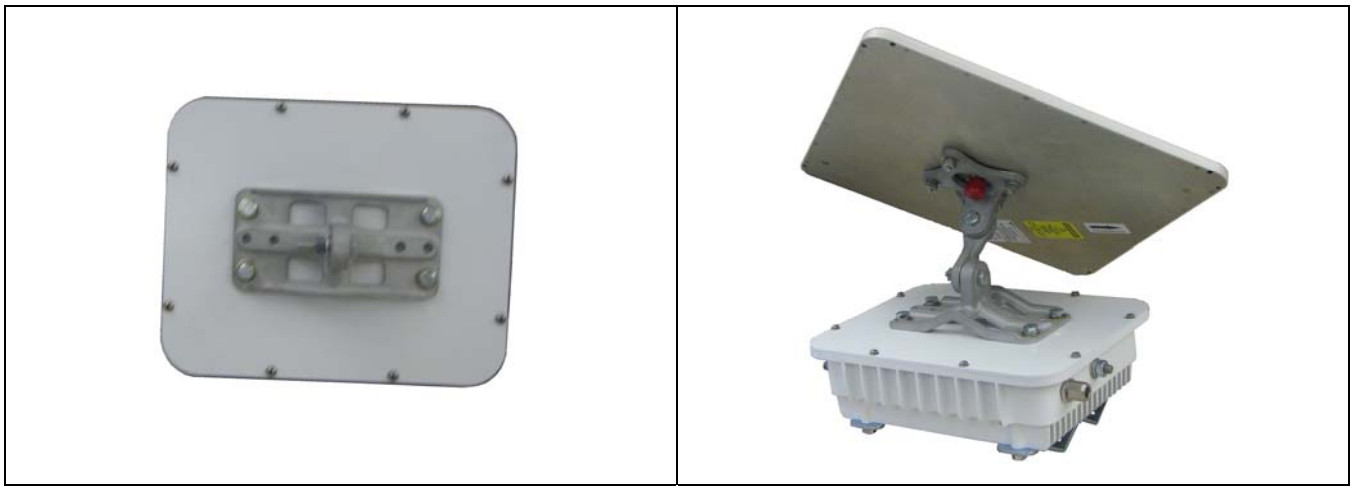


Figure 7-2: Mounting a Directional Antenna to the VIDA Broadband Client

7.8 RADIO CHASSIS AND CABLING

7.8.1 Attaching Client Cables

To connect power to Client

1. Connect the M/A-COM power cable to the proper power source.
2. Mate the other end of the power cable's connector to the 3-pin power connector on the Client by visually aligning the key and firmly push and turn the outer locking ring clockwise until it stops. A click will be sensed to confirm proper mating.
3. For added protection against long-term exposure to weather, industry techniques for sealing the data connection may optionally be performed.

To connect DATA cable to Client

1. For Ethernet and Fiber Optic models, fabricate the cable as described in Section 11 or follow the manufacturer's instructions.
2. Connect one end of the cable to the LAN or Fiber Optic network connection.
3. Mate the other end of the DATA cable's connector to the Client by visually aligning the key and firmly push and turn the outer locking ring clockwise until it stops. A click will be sensed to confirm proper mating.
4. Ensure the dust cap is fully seated on the service port.
5. For added protection against long-term exposure to weather, industry techniques for sealing the data connection may optionally be performed.

Upon connection, verify that all cabling is not under any stress, a service loop is maintained, and the cabling is restrained according industry techniques.

8 INSTALLING A MOBILE STATION CLIENT

This section provides general information regarding installation of the VIDA Broadband Client in mobile station configurations. For best results, the Client should be installed by one of the many M/A-COM Authorized Service Centers located throughout the United States. Their experienced service personnel can provide a proper radio installation and make any final adjustments that may be needed.

8.1 PLANNING THE INSTALLATION

Before starting the installation, plan carefully to ensure the installation meets the following requirements:

- Safe for the operator and passengers.
- Away from airbag deployment area.
- Convenient for the operator to use.
- Neat, safe and clean.
- Protected from water damage.
- Easy to service.
- Cable connections accessible.
- Out of the way of auto mechanics.
- Out of the way of passengers.

Vehicular Electronics - Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical of the types of electronic devices which may be prone to malfunction due to the lack of protection from radio frequency energy present when a radio is transmitting. If the vehicle contains such equipment, consult the dealer to determine if such electronic equipment will perform normally when the radio is transmitting.

Air Bags – For driver and passenger safety, avoid mounting the radio above or near airbag deployment areas. Note that vehicles may contain front driver and passenger side airbags as well as side airbags. For occupant safety, verify the location of all airbags before installing radio equipment.

For passenger safety, mount the radio securely so that the unit will not break loose in the event of a collision. This is especially important in station wagons, vans and similar type installations where a loose radio could be extremely dangerous to the vehicle occupants.

When determining a mounting location for the Client and associated peripherals, avoid high traffic environments within the passenger compartment, trunk or other compartment where feet, tools or other objects may accidentally damage cable connections. The Client and other peripherals should be mounted such that connectors and other fragile components face away from high traffic areas, yet accessible for servicing.

Also, careful attention must be given to ventilation and heat dissipation. The Client should be mounted with the heat sink fins vertically positioned and ample air space around the unit.

8.1.1 Tools Required

The following tools may be required when installing a Client in mobile applications:

- Crimping tool for fuse holder.
- Electric drill for drilling mounting holes.
- Drills, drill bits, 5/16” nut driver bit and circle cutters.
- Phillips and flat-blade screwdrivers.

8.1.2 Recommended Kits and Accessories

M/A-COM recommends using the following parts and accessories during installation of the Standard Client in a mobile configuration.

8.1.2.1 DC Power Cable Kit

The Fuse Distribution Rail Kit FS23057 provides the necessary hardware to wire up the Standard Client to a vehicle’s power system. This kit provides an ATC style fused common buss lead that is designed to connect to the vehicle’s battery. The fused buss lead provides power to a Fuse Distribution Rail assembly. This assembly may be mounted nearby the Client and, if necessary, be expanded to power multiple hardware components.

Table 8-1: Fuse Distribution Rail Kit

KIT NUMBER	DESCRIPTION	PICTORIAL
FS23057	Kit, Fuse Distribution Rail. Includes: (1) Fuse Distribution Rail Assembly (1) In-Line ATC Fuse Holder **(1) 15-Amp ATC Fuse** (1) 30-Amp ATC Fuse 20 Feet of 10-AWG Red Wire 1 Foot of 10-AWG Black Wire (1) Moisture-Resistant Butt Splice (2) 3/8-Inch Ring Terminals.	
FS23058	Kit, Fuse Distribution Accessory. Includes: (1) Fuse Block (1) Protective Marker (1) Fuse Block Jumper (1) 5-Amp ATC Fuse (1) 15-Amp ATC Fuse	

8.1.2.2 Mobile Mounting Bracket

The mobile mounting bracket FM-010668 shown in Figure 8-1 installs to the bottom of the Client and provides easy installation of the Client in a variety of mobile applications. Standard stainless steel ¼ x 20 hardware is used to attach the bracket to the Client.

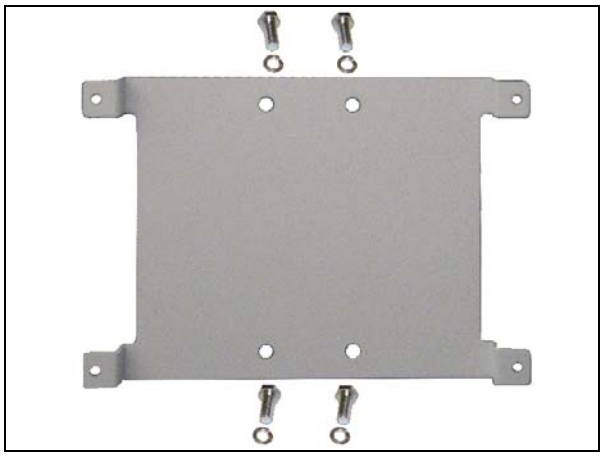


Figure 8-1: Mobile Mounting Bracket (FM-010668)

8.1.2.3 Mobile Antenna and Mounts

The recommended mobile antenna model (B)MEFC49005HF (see Table 8-2) is an elevated feed, 5.5 dBi gain antenna. Electrically, the antenna requires no ground plane to meet VSWR performance specifications. However, it may be necessary to use this antenna with a ground plane to meet MPE requirements (see Section 1.2). Low loss high frequency permanent and magnetic mount cable kits are also available and shown in Table 8-2.

Table 8-2: Power Connector Pin Configuration for DC Voltage Sources

PART NUMBER	DESCRIPTION	
MAXRAD: (B)MEFC49005HF	Antenna, collinear, elevated feed, 5.5 dBi, no ground plane.	
MAXRAD: MHFML195C	Permanent mount, 17 ft. Cable, TNC male (loose).	
MAXRAD: GMHFML195C	Magnetic Mount, **17 ft**. Cable, TNC male (attached).	

CAUTION

Be careful to avoid damaging vital parts (fuel tank, transmission housing, etc.) of the vehicle when drilling mounting holes. Always check to see how far the mounting screws will extend below the mounting surface before installing.

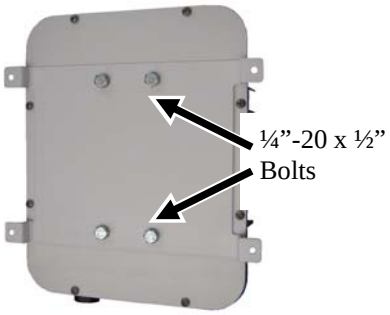
CAUTION

If pilot holes must be drilled, remove all metal shavings from drilling holes before installing screws.

8.2 INSTALLING THE CLIENT

Refer to Section 8.1 when choosing a mounting location for the Client and other peripherals. Re-check the locations for brake lines, gas tanks, batteries, or other objects located behind the locations where holes will be drilled or screws installed.

1. Install the mobile mounting bracket to the bottom of the Client using four (4) ¼" - 20 x ½" hex head bolts and lock washers.



2. Place the Client into the desired mounting location in the vehicle.

3. Secure the Client by one of the following methods:

   a. Use four No. 10 x ¾" self-tapping screws supplied (alternately, use No. 10 x 1-1/2 if needed.); or,

4. Use the client as a template to mark locations and pre-drill pilot holes. Install using appropriate hardware.

8.3 POWER AND DATA CABLE INSTALLATION

To assure the feasibility of planned cable routing, it is suggested to run the cables before mounting the Client. Other associated hardware options such as cameras, mobile terminals, etc. should be considered when planning the cable runs.

Be sure to leave slack in each cable so the radio may be pulled out for servicing. Coil any surplus cables and secure them out of the way. Try to route the cables away from locations where they will be exposed to heat (exhaust pipes, mufflers, tailpipes, etc.), battery acid, sharp edges or mechanical damage or where they will be a nuisance or hazard to automobile mechanics, the driver or passengers. Keep wiring away from electronic computer modules, other electronic modules and ignition circuits to help prevent interference between these components and radio equipment.

In addition, try to utilize existing holes in the firewall, trunk wall and the channels above or beneath doors. Channels through door and window columns that are convenient for running cables may also be used when practical. Again, protect cable runs from accidental damage by avoiding sharp edges and unprotected cable access holes.

8.3.1 Installing The Main Power Cable

Power is supplied to the Client through a 2-pin Conxall Multi-Con-X 2-pin connector #4180-2SG-300). In mobile applications, the High and Low Power Standard client will operate from 11 to 30 VDC. Pre-wire the DC power cable per the following instructions.

8.3.1.1 Install Main Fuse Holder and 10-AWG Red Wire

The main power fuse, its holder, and related items are included in Fuse Distribution Rail Kit FS23057 illustrated in Table 8-1. Follow the procedure in this section to wire fused main power from the vehicle's battery to the location of the radio and the Fuse Distribution Rail Assembly in the vehicle's trunk. The Fuse Distribution Rail Assembly is installed during the subsequent procedure (Section 8.3.1.2).

Do **not** install the fuse holder or the red wire near the engine, transmission or exhaust system. Excessive engine heat can cause permanent damage to these components and can lead to intermittent electrical connection to the battery.

Before making connections to the battery's positive post, carefully disconnect the battery's negative (ground) cable. This will prevent tools or other metallic objects which come in contact with the battery's positive terminal from shorting to vehicle chassis ground, causing sparks or even a fire or an explosion! When disconnecting the negative cable, cover/insulate the positive post if it is not already so a tool cannot short between the posts.

A fuse must not be installed in the main fuse holder until all wiring is complete. This will prevent the unit from powering up prematurely and/or causing an in-rush of current that could lead to shorting of the battery, sparks, or even fire.

1. Strip one of the ATC Fuse Holder's wires and crimp a 3/8-inch ring terminal to it. Both items are included in the Fuse Distribution Rail Kit.
2. **Verify the fuse is NOT in the Fuse Holder.**

3. Connect the ring terminal directly to the battery's positive post (or if present, to a stud on the vehicle's main/non-switched power distribution terminal block).
4. Strip the Fuse Holder's other wire, strip one end of the 20-foot long 10-AWG red wire, and then connect these two wires together using a 10-AWG moisture-resistant butt splice. The red wire and the butt splice for this connection is included in the Fuse Distribution Rail Kit.

Plan the routing of the 10-AWG red wire carefully, using an existing access hole in the vehicle's firewall if possible. Alternately, drill a new hole approximately 3/8-inch in diameter and install a small rubber grommet to protect the wire from chafing on the hole's sharp metal edge. **To prevent fumes and moisture from entering the passenger compartment, this hole/grommet/wire combination must also be sealed with a silicon-based sealer before completing the installation.**

5. Route the other (load) end of the 20-foot long red wire through a wire-loom then through the grommet in the firewall. This load end of the red wire will later be connected to a Fuse Block clipped on the Fuse Distribution Rail Assembly (both parts of the Fuse Distribution Rail Kit). The Fuse Distribution Rail Assembly will be located near the radio in the trunk.
6. Continue routing the 20-foot red wire through channels in the vehicle to the location of the Client. Remove interior panels, door kick panels, etc. Protect the wire from possible chafing where necessary.

8.3.1.2 Assemble and Install Fuse Distribution Rail Assembly

The Fuse Distribution Rail Assembly must be completely assembled and installed in the vicinity near the Client. This rail assembly, included in Fuse Distribution Rail Kit FS23057, comes preassembled with only one (1) Fuse Block on the rail.

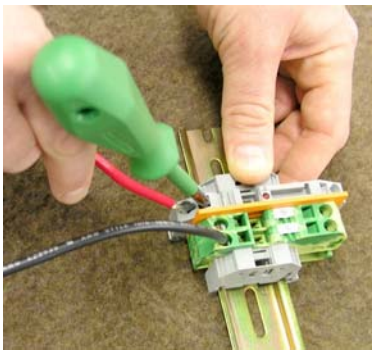
The Fuse Distribution Rail Assembly has a DIN-type rail allowing additional Fuse Blocks to be added to it if fuse expansion is necessary in the future, such as for multiple radio installations. The rail may be cut to decrease its length if necessary, but enough room for additional future expansion should be considered first. Install the rail in accordance with the following procedure:

1. Mount the Fuse Distribution Rail Assembly in the vicinity of the Client's mounting location, but where casual contact is not likely. Use self-threading screws (not supplied) and any available mounting slots in the DIN rail to mount the block.
2. Strip one end of the 10-AWG black wire (included with the Fuse Distribution Rail Kit) and crimp a 3/8-inch ring terminal to it.
3. Near the Fuse Distribution Rail Assembly, locate an area of vehicle chassis ground within approximately six (6) inches of the assembly and strip the area of any paint or dirt to expose a bare metal surface.
4. Drill a hole as necessary and connect the ring terminal to chassis ground. Use a self-threading screw or other appropriate hardware to ensure a reliable metal-to-metal contact. Tighten securely.
5. Cut the black wire to a length long enough to reach a green-yellow Grounding Block on the Fuse Distribution Rail Assembly, plus length for a service loop. Strip the end to prepare it to connect to a Grounding Block.

6. The Fuse Distribution Rail Assembly has two green-yellow Grounding Blocks. Each Grounding Block has two wire-clamps with associated wire-clamp release slots. As shown in the photo at the right, insert a #1 or #2 flat-blade screwdriver completely into one of the wire-clamp release slots. Insert the screwdriver until it is captured in a vertical position as shown in the photo in the next step.

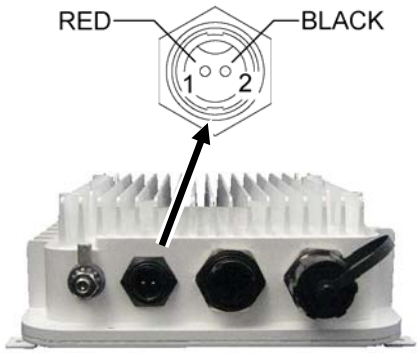
7. Insert the stripped end of the black wire fully into the wire-clamp beside the screwdriver, and then remove the screwdriver to lock the wire in the clamp. The adjacent Grounding Block is electrically connected together, so this black wire grounds both blocks.

8. Prepare to connect the 10-AWG red wire from the Fuse Holder at the vehicle battery to the Fuse Block of the DIN rail assembly by cutting off the excess length and stripping the end. Leave enough wire length for a service loop.
9. As shown in the photo at the right, connect the 10-AWG red wire to the Fuse Block's supply-side wire-clamp.

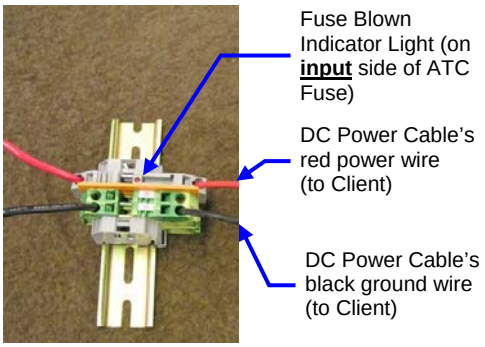


8.3.1.3 Installing the DC Power Cable to the Client

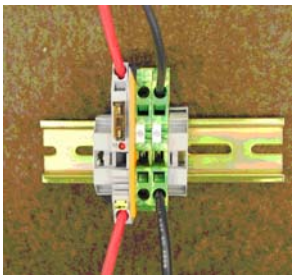
1. Prepare a short 12 to 14 AWG red and black wire (not supplied) to run between the fuse block and the Client's DC power connection.
2. Install a Conxall pin on one end of the red wire. Install the red wire into Pin 1 of the Conxall connector.
3. Install a Conxall pin on one end of the black wire. Install the black wire into Pin 2 of the Conxall connector.
4. Assemble the shell and strain relief to the connector body.
5. Mate the assembled connector to the Client's 2-pin power connector as follows: Visually align the key and firmly push and turn the outer locking ring clockwise until it stops. A click will be sensed to confirm proper mating.



6. Prepare the Client DC cable by cutting excess length from both wires and stripping the ends. Leave enough wire length for service loops.
7. Connect the red wire to the wire-clamp on the Fuse Block's load-side wire-clamp.
8. Connect the black wire to the wire-clamps on the Grounding Block.



9. Install a 2AMP ATC automotive fuse into the Fuse Block.
10. Tie and stow all cables and wires as necessary so they remain out of the way of casual contact, and so wire chafe is avoided.



11. Apply the sticker included in the Fuse Distribution Rail Kit in the vicinity of the Fuse Block as future reference for service personnel.

CAUTION

Installing a fuse with the wrong current rating could cause an unsafe condition and/or a prematurely blown fuse. Verify the correct fuse value for the device being installed.

8.4 GROUNDING STUDS

Mounting studs for grounding the Client are located on two sides of the Client. While these studs are primarily used for grounding in Fixed Station installations, it is recommended to run a ground strap from one of the two ground studs to a nearby chassis ground.

CAUTION

DO NOT connect the Return (PWR-) connection directly to the negative battery post. In the event the negative battery post wiring becomes disconnected from the chassis, this would cause all vehicle current to source back through the Client connection to ground, thus causing damage to the client.

8.5 NETWORK/DATA CONNECTION

The Standard Client in a mobile configuration connects to the network using a standard Ethernet RJ-45 protocol. The DATA connector is a Tyco/Electronics, Industrial Circular Ethernet Connector Part number: 1738607-2, an industrial grade, rugged, UV rated, weatherproof, dustproof and made for use in extreme electrical and climatic conditions. The connector meets IP67 industrial standard for weatherproof and dustproof electrical connections. Refer to Section 11.1 for cable/connection installation instructions.

The service port has a dust cap which is normally installed to provide sealing when not in use. Sealing of all other ports on the Client is provided through mandatory usage connections.

Do not install the fuse until the installation is completed and all connections have been checked.

9 CONFIGURATION, OPERATION AND ALIGNMENT

9.1 CONFIGURATION

The Unified Administration System (UAS) manages all Client activities. UAS activities include system configuration such as access permissions, Quality of Service connectivity, etc. UAS activities also include hardware configuration such as channel assignment and power output.

All configuration requirements are managed by the UAS. Specific configuration may begin once a MAC address for the specific Client has been assigned in the UAS database. Refer to the UAS manager for specific requirements regarding channel assignment and RF power output.

1. Apply power to the site.
2. Verify proper operation by performing the following basic checks:
   a. Verify that the AC or DC power supply is operating properly.
   b. Notify the UAS manager that the site is on-line.
   c. Verify with the UAS manager that the site has full connectivity and all is operational.

9.2 OPERATION

Operational requirements for the Client are simplified. All Client activities are managed by the UAS, therefore on-site activities are minimized. Only hardware related on-site operational requirements exist. Perform the following operation checks:

1. Make sure the site meets the operational requirements defined by the UAS.
2. Plug the Serial RSSI Test Box into the serial test port and verify that sufficient RSSI is present from the Base Station.
3. Ensure that all cables, connections, access panels, etc. are properly secured before leaving the site.
4. Follow up on any specific site deployment tasks not covered in this manual.

9.3 CLIENT PRETEST AND ALIGNMENT

The Client is aligned and tested at the factory before shipment to ensure that product specifications and regulatory requirements are met. No further field adjustments are required. If a unit is suspected to need realignment, return the unit to the manufacturer for repair.

9.4 FIXED ANTENNA ALIGNMENT AND POLARIZATION

On Clients using a directional antenna, it will be necessary to properly align the antenna. The following procedure describes this process.

1. Verify that the UAS has connectivity to the Client.
2. Connect the RSSI Test Box to the serial service port.
3. Verify the antenna is mounted in the proper polarity (horizontal or vertical).
4. Loosen the pinion bolt and adjust the antenna for best RSSI reading.
5. Tighten all hardware, disconnect Test Box and seal all connections.

10 TROUBLESHOOTING AND SERVICING

10.1 TROUBLESHOOTING

If a unit is suspected to be faulty or need service and repair, perform the following checks:

1. Visually inspect the installation for obvious defects such as worn, weathered or frayed cabling.
2. Verify that the unit is receiving sufficient voltage and current to the power input connector.
3. Use the Serial RSSI Test Box and verify signal quality from the Base Station.
4. Replace any defective antenna or power source components as required, and return any inoperable Clients to the manufacturer for repairs.

10.2 TUNING AND ALIGNMENT

Every VIDA Broadband Client is fully aligned, including TX Frequency and RF Power Output, before shipment to ensure compliance with various regulatory requirements and product performance. No further tuning or alignment is required by the customer or installer during the installation process. Basic control of the Client, including RF power output and channel assignment, is accomplished by the UAS during site configuration.

The Client is not a field repairable unit. If a unit is suspected to need servicing or re-alignment, then the unit should be removed from service and returned to M/A-COM for repairs. Periodic checks of frequency and modulation bandwidth should be performed during routine preventative maintenance checks.

11 CABLE FABRICATION

The following sections provide instructions for fabricating the network cable connections needed to connect to a Client. The assembly procedures are provided for reference and are superseded by any instructions provided with the connector. Always read and follow any instructions provided by the connector manufacturer

11.1 ETHERNET CABLE PLUG KIT

The Ethernet cable connected to the Client uses a RJ-45 connector protected by an Industrial Circular Ethernet plug assembly that protects the RJ-45 connector from the elements.

The Stranded Wire Plug Kit (Tyco Electronics # 1738607-2), shown in Figure 11-1, consists of an 8-position Category 5e RJ-45 plug, load bar, and plug assembly. The load bar is used to hold the cable wires for insertion into the RJ-45 plug. The RJ-45 plug must be terminated and then installed into the plug assembly. The RJ-45 plug is held in the plug assembly by the locking tab. The cable fitting holds the RJ-45 plug in the plug assembly and seals the plug at the cable end. When engaged, the connectors are held together by a locking mechanism (coupling ring and bayonet lock), which prevents accidental disconnection. The engaged connectors are sealed by the interfacial seal.

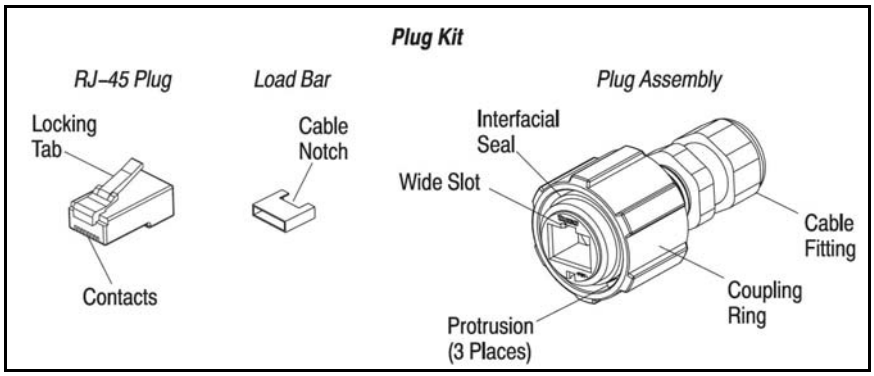


Figure 11-1: Tyco/Electronics Industrial Circular Ethernet Connector Plug Kit (1738607-2)

11.1.1 Tools Required

- Modular Plug Hand Tool, 3-231652-0 (Tyco/Electronics-AMP)
  Includes; Hand Tool, 2-231652-0 and Die Set, 1-853400-0

11.1.2 Cable Selection

The RJ-45 plug will accept Category 5e, 100–ohm unshielded round cable with the following specifications:

- Cable type: 8–conductor
- Conductor size: 24 AWG
- Conductor type: 7–strand copper
- Conductor insulation diameter: 0.039 in. (0.99 cm) maximum
- Cable jacket diameter range:

  RJ-45 plug accepts: 0.190 through 0.220 in. (4.83 through 5.59 cm) OD (single jacket)

  Cable fitting accepts: 0.18 through 0.31 in. (4.6 through 7.9 cm) OD (double jacket)

11.1.3 Cable Preparation

Prepare the cable using the following procedure:

CAUTION

Reasonable care must be taken not to scrape or nick any part of the cable during the stripping operation.

1. Slide the plug assembly (cable fitting end first) onto the cable. See Figure 11-2, Detail A.

2. Proper strip length is necessary to insert the conductors into the contact slots. The recommended strip length is given in Figure 11-2, Detail B.

NOTE

Insulation of individual conductors **must not** be cut or removed. This could result in shorted or open connections.

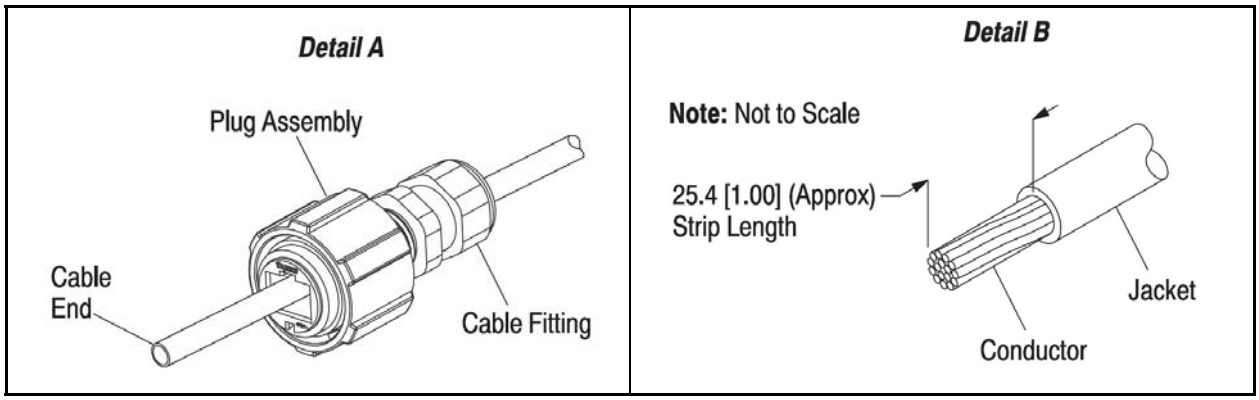


Figure 11-2: Cable Preparation

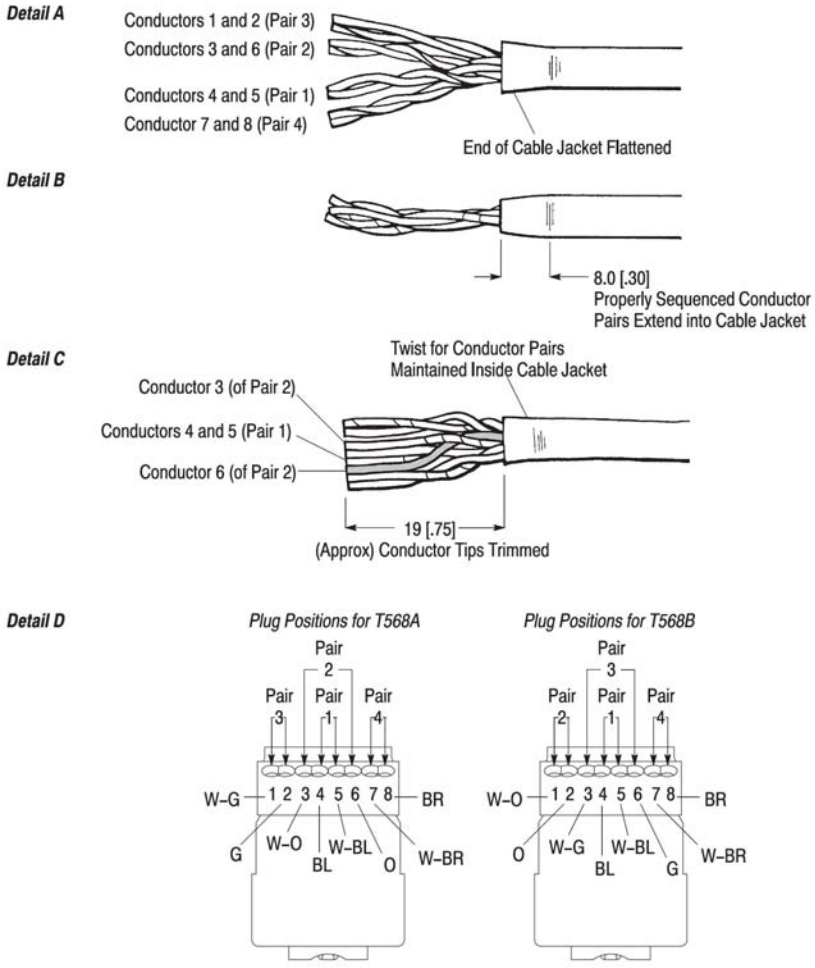
3. Conductor pairs must be oriented side–by–side in the order shown in Figure 11-3, Detail A. The end of the cable jacket must be flattened so that the conductor pairs lay side–by–side.

4. Properly sequenced conductor pairs should extend into the cable jacket to the dimension given in Figure 11-3, Detail B, creating an oblong shape.

5. The conductor tips must be trimmed evenly to the dimension shown in Figure 11-3, Detail C. Proper orientation of conductors must be maintained.

6. The conductor pairs must be untwisted and arranged according to EIA/TIA T568A or T568B (defined in Figure 11-3, Detail D). IT IS CRITICAL that the pairs are NOT untwisted inside the cable jacket.

When arranging conductor pairs, IT IS IMPORTANT that Conductor 6 be crossed over Conductors 4 and 5 as shown in Figure 11-3, Detail C.



CONDUCTOR PAIR	CONDUCTOR PAIR For Electrical Schematic		CONDUCTOR COLOR CODE (Abbreviation)	
	T568A	T568B	OPTION 1	OPTION 2
1	4	4	Blue (BL)▪	Red (R)
	5	5	White–Blue (W–BL)	Green (G)
2	3	1	White–Orange (W–O)	Black (BK)
	6	2	Orange (O)	Yellow (Y)
3	1	3	White–Green (W–G)	Blue (BL)
	2	6	Green (G)▪	Orange (O)
4	7	7	White–Brown (W–BR)	Brown (BR)
	8	8	Brown (BR)▪	Slate (S)

▪A white marking is acceptable.

Figure 11-3: Cable Preparation Continued

11.1.4 Termination

Terminate the RJ-45 plug to the cable end using the following procedure:

1. The conductors (maintaining arrangement) must be inserted into the load bar (oriented so that the cable notch will align with the contacts) until the cable jacket rests against the cable notch. The conductor twist must not enter the front of the load bar. The conductors must be trimmed evenly and square with the front edge of the load bar to the dimension given in Figure 11-4, Detail A.

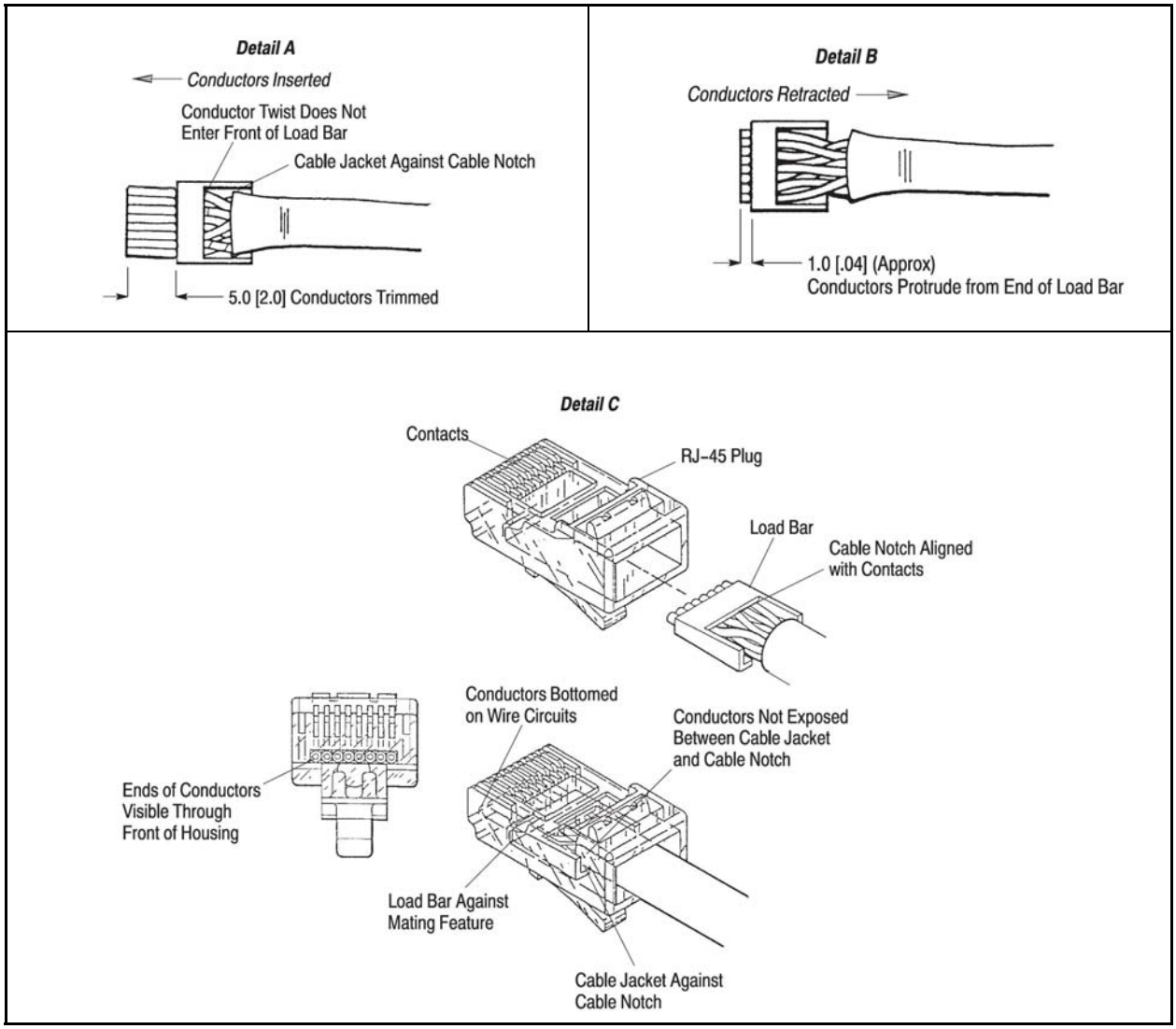


Figure 11-4: Termination Requirements

2. The conductors must be retracted from the load bar so that the conductors protrude from the end of the load bar to the dimension given in Figure 11-4, Detail B. The top of the load bar must not be deformed.

NOTE

If the load bar is deformed, the conductor twist entered the front of the load bar

3. The load bar (oriented so that the cable notch is aligned with the contacts) must be inserted into the RJ-45 plug until it butts against the mating feature of the RJ-45 plug, and the conductors are bottomed on the wire circuits. The cable jacket must be against the cable notch after the load bar is fully seated. The conductors must not be exposed between the cable jacket and cable notch. The ends of the conductors must be clearly visible through the front of the RJ-45 plug. See Figure 11-4, Detail C.

NOTE

If the conductors do not bottom on the wire circuits, they must be re-trimmed (after removing the load bar/cable assembly from the RJ-45 plug), and re-inserted into the RJ-45 plug. If the conductors are too short, the cable must be re-stripped.

4. The RJ-45 plug must be terminated to the cable according to the instructions included with the tooling.

11.1.5 Assembly

Assemble the RJ-45 connector into the plug assembly using the following procedures:

1. Align the locking tab of the RJ-45 plug with the wide slot at the front (end opposite the cable fitting) of the plug assembly. See Figure 11-5, Detail A.

2. Depress the locking tab, and insert the RJ-45 plug into the plug assembly. Gently pull the cable until the RJ-45 plug is fully seated. There should be approximately 12.7 mm [.50 in.] of the RJ-45 plug protruding from the front of the plug assembly. See Figure 11-5, Detail B.

CAUTION

To avoid damage to the connection, the cable must be pulled GENTLY when seating the RJ-45 plug.

3. While holding the RJ-45 plug in position, rotate the cable fitting as shown in Figure 11-5, Detail B until tightened to a torque of 1.13 N–m [10 lbf–in.].

NOTE

The given torque must be met in order for the cable fitting to seal the plug at the cable end.

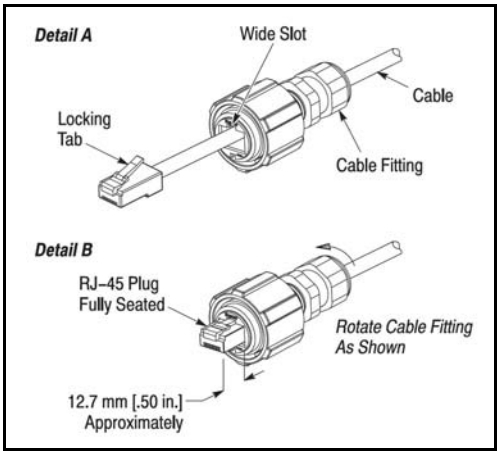


Figure 11-5: Assembly Detail

11.2 Fiber Optic Cable Assembly

The Fiber Optic cable connected to the Client uses a rugged LC connector protected by an Industrial Circular plug assembly that protects the connector from weather elements. The Fiber optic Plug Kit (Tyco Electronics # 1828618-1), is shown in Figure 11-1. The sealed circular LC connector accepts tactical cable, with a 4.5mm – 7.5mm outside diameter and a pair of 2.0mm jacketed subunits. When engaged, the connectors are held together by a locking mechanism (coupling ring and bayonet lock), which prevents accidental disconnection. The engaged connectors are sealed by the interfacial seal.

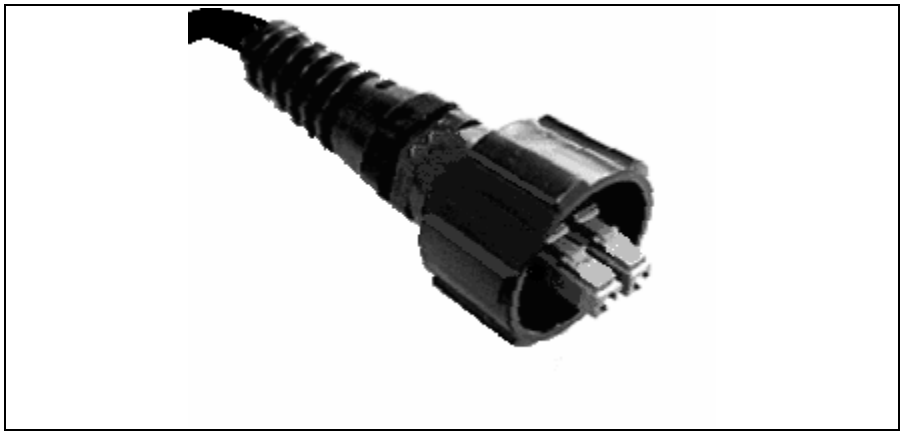


Figure 11-6: Tyco/Electronics LC Fiber Optic Connector Plug Kit (1828618-1)

11.2.1 Tools Required

The following tools are required to fabricate LC series Fiber Optic connectors:

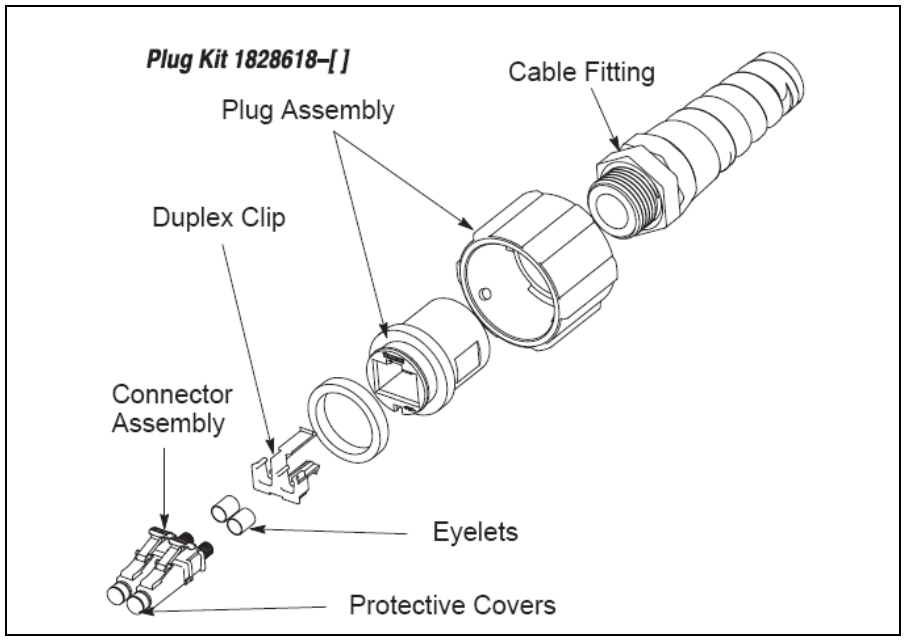
- Tyco Electronics PRO–CRIMPER 58532–2;
- Tyco Electronics Die Set 58424–1;
- 19mm wrench;
- 19mm torque wrench (N–m or in–lbs);
- Strip Template 39–635829–7;
- Cable stripping tool;
- Sharp Scissors;
- Tyco Electronics instruction sheet 408–8675 and fiber optic connector termination tooling.

11.2.2 Fiber Optic Connector Assembly Procedure

These procedures are provided as a reference and are superseded by any instructions provided with the connector. Perform the following to assemble a LC series (Tyco Electronics # 1828618-1) Fiber Optic connector:

1. Slide the plug assembly over the fiber jacket.
2. Using a pen, mark the outer jacket at 60mm from the end (breakout length).
3. Working in sections, slit and remove the outer jacket to the breakout mark.

4. Using shears, cut the strength members and filler flush with the jacket.
5. Using the template provided in the connector kit, mark both the 2.0mm jacketed subunits at the 27mm mark and the 8mm able slit mark.
6. Remove the jacket of each subunit to the 27mm mark with a strip tool.
7. Using a strip template, mark each 900 mm buffer at15.5mm
8. Using a sharp scissors, carefully cut two slits (8mm long) on each jacket. Using a buffer stripper, strip off the buffer in at least three pieces. Using a clean, lint–free cloth (soaked in alcohol), remove any residue from the fiber.
9. Carefully fan back the jacket and strength members, then slide the eyelet over the strength members as shown in Figure 8.
10. After the fiber has been inserted into the connector ferrule, carefully slide the eyelet rearward to unfurl the slit jacket and strength members. Uniformly distribute the aramid and position the slit jacket over the rear body.
11. While holding the connector, push the eyelet forward.
12. Using Tyco Electronics PRO–CRIMPER hand tool and crimping die set 58424–1, crimp the eyelet onto the strength members and jacket.
13. Snap the connectors into the duplex clip.
14. Place the connectors in the plug assembly.
15. Depress both latches and push the connectors into the plug assembly until it bottoms. You will hear an audible “click.”
16. Using two 19mm wrenches, tighten the cable fitting to 0.68 — 0.90 N–m [6.0 — 8.0 –in–lbs].



11-7: Fiber Optic Connector Assembly

11.2.3 Protective Cover Assembly

1. Open the loop on the lanyard and slide it over the plug nut.
2. Push the loop past the nut until it snaps into the groove.
3. The properly installed protective cover should appear as shown below..

11-8: Protective Connector Cover Installed

12 TECHNICAL SUPPORT

M/A-COM's Technical Assistance Center (TAC) resources are available to help you with overall system operation, maintenance, upgrades, and product support. TAC is your point of contact when you need technical questions answered.

Product specialists, with detailed knowledge of product operation, maintenance, and repair, provide technical support via a toll-free telephone number (in North America). Support is also available through mail, fax, and e-mail.

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North America:	1-800-528-7711 (toll free)
International:	1-434-385-2400
FAX:	1-434-455-6712
e-mail:	tac@tycoelectronics.com

13 CUSTOMER RESOURCE CENTER

If any part of the system equipment is damaged on arrival, contact the shipper to conduct an inspection and prepare a damage report. Save the shipping container and all packing materials until the inspection and the damage report are completed. In addition, contact the Customer Resource Center to make arrangements for replacement equipment. Do not return any part of the shipment until you receive detailed instructions from a M/A-COM representative.

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