

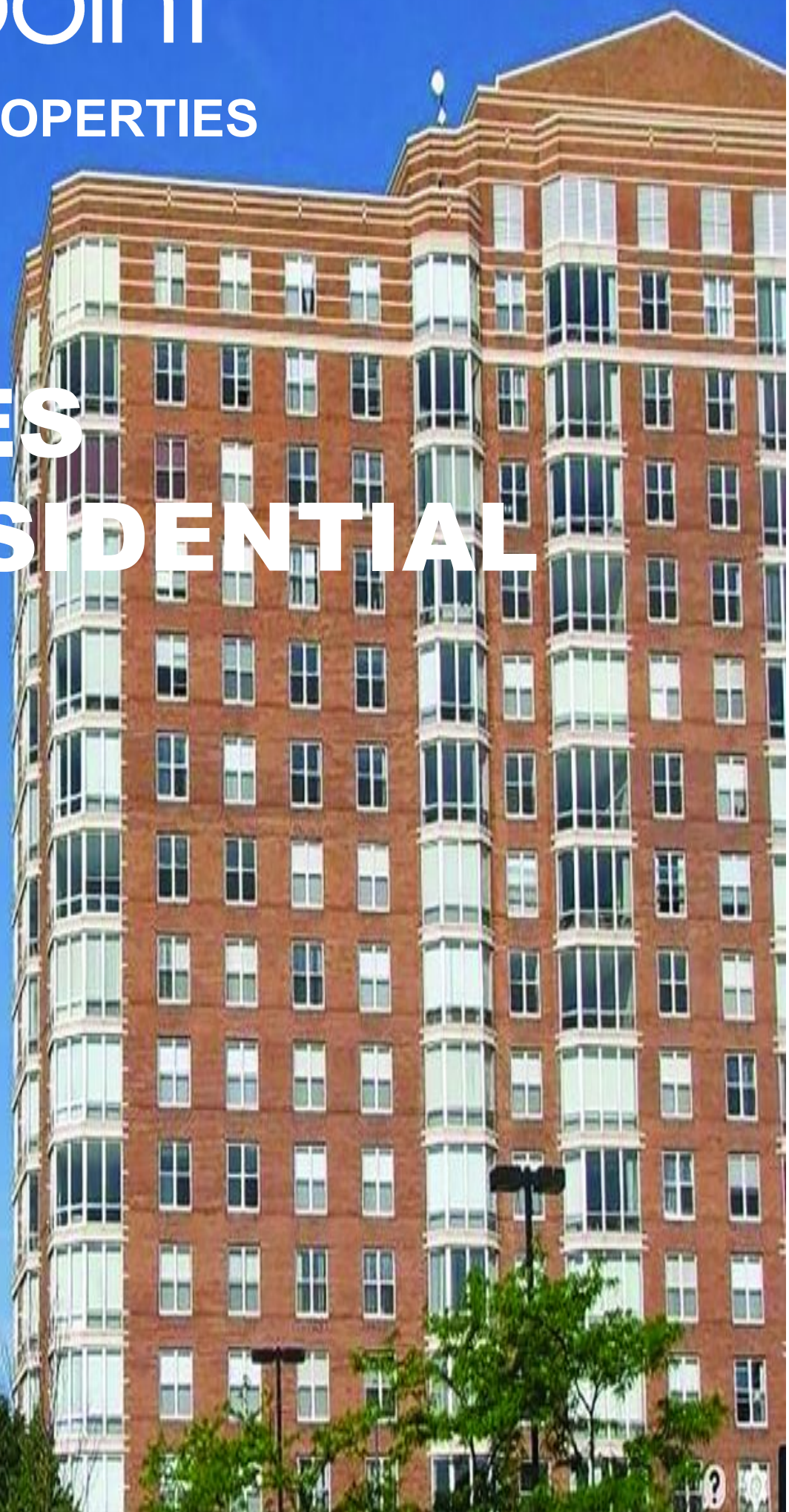


BROADBAND PROPERTIES

FIBER REACHES THE RESIDENTIAL UNIT

Residents Demand
More Choices

New Technologies
Simplify Installation



Highspeed Broadband Service

The Essential 21st Century MDU Amenity

MDU developers and owners know they are on frontline of the broadband revolution. During the pandemic, working from home with expansive use of online conferencing is the new normal. With school starting across the country, online learning will place more demands on local broadband networks. E-commerce is booming as owners can attest by virtue of resident expectations for enhanced package receiving and storage capabilities. Even as the pandemic is controlled, elevated demand for higher speeds, particularly upload speeds (as compared to prior Covid-19 demand), likely will persist. Adding [fuel to this fire](#) are overpriced cable and satellite television programming packages and the popularity of online streaming services.

Owners whose properties lack adequate broadband connectivity are in an unenviable position, whether due to unavailable robust broadband service or limited property infrastructure such as inadequate risers, pathways, or lack of spare conduit to accommodate more than one service provider. Old copper telephone wire has limited utility. In some instances, a saving grace is that other multi-family property owners in the area likely suffer from the same lack of robust broadband options.

Many developers and owners are not ready to “cut the cord” on linear video, as they are not yet comfortable with providing a “streaming-only” video option for residents.[1] This is particularly true among operators of retirement communities. For new developments, retrofits, and when otherwise feasible, sophisticated MDU developers and owners are inviting multiple broadband service providers to extend their networks into their communities and offer 21st century broadband services to their residents. [In many ways, this is the “next act” in the “play” that began 15-20 years ago when cable broadband offerings overwhelmed the local telephone companies that were wedded to DSL technology.]

Whether engaging with established triple-play providers or emerging broadband providers, developers and owners should frame their broadband strategies based on the following considerations:

1. Robust broadband service (and meaningful competition) is a challenge for MDU developers and owners outside of major urban areas. Substantial cable industry consolidation has occurred in recent years. Charter acquired Time Warner and Bright House Networks in 2016. Altice acquired Cablevision the same year. Unfortunately, these cable operators rarely compete against each other in the same market. In urban markets the major telephone companies, AT&T and Verizon, offer competitive (typically fiber-based) triple-play services and Century Link is building out fiber-based networks in some urban areas. To date, new broadband-focused providers are concentrated in urban areas. In many 2nd and 3rd tier markets, the video and broadband offerings of the major telcos rely on aging in-place DSL technology; thus, the sole option is the local cable

operator. Only in recent years is a semblance of competition emerging in 2nd and 3rd tier markets.[2]

a. The business and legal terms and conditions of the major service providers' standard MDU access and marketing agreements range from unreasonable and a challenge to read to those that are reasonably balanced and comprehensible. Competitive broadband providers' agreements tend to be balanced and readable. These providers appear focused on reducing the "friction" in implementing relationships with MDUs.

2. Plan for the future. Properties should be constructed to support inbuilding wiring/facilities of multiple service providers (even if today there are no viable competitors to the local triple-play when the property is being built).
 - a. State and Federal laws and policies largely prohibit exclusive access arrangements, but exclusive of use of inside wiring by a single provider is the predominant regulatory policy and industry practice today.
3. Beware of exclusive marketing agreements with triple-play providers or other broadband providers. These agreements may discourage competitors from extending facilities and services to a development or community.
 - a. Franchise cable operators typically leverage their cable franchise to provide broadband service throughout their franchise service areas.
 - b. Except for rural broadband services providers that are recipients of Federal USF or RUS broadband funding or similar state programs, emerging broadband providers are not obligated to extend broadband service to MDU developments.
4. Critically evaluate bulk video service arrangements. Ten years ago, bulk linear video deals provided owners positive revenue streams while delivering a valued amenity for many prospective residents. The migration to online streaming and the rising costs of linear video programming (increasing programming fees, add-on fees, and annual price increases) are undercutting the value of bulk video arrangements in MDUs.
5. Triple-play and broadband-only agreements should not restrict developer/owner flexibility in selecting IoT services or IoT service providers. The Internet of Things (IoT) is the integration of wireless technology, remote sensing devices, and analytics that either monitor or control property-wide or unit-specific systems such as HVAC, access, video surveillance, and electricity or water usage or both. The applications and efficacy of these applications are evolving. Whether a property's broadband service provider(s) can best deploy and manage these systems or whether focused IoT providers can do a better job remains to be determined.
6. Experienced consultants can bridge owners' and developers' knowledge gap in assessing services providers' business offers. Excluding the largest REITs, most developers and owners do not enter into agreements with broadband providers on a continuing basis to develop a "sense of the market." We have two thoughts regarding consultants. First,

understand the roles/services the consultant will perform. Second, in our view, flat fee or hourly rate arrangements are preferable to “percentage of savings” compensation schemes. The latter can be challenging to define and can result in an unexpected case of “buyer’s remorse.”

[1] This entry is not intended to speak to the off-campus student housing segment of the MDU industry.

[2] In unserved rural markets (no broadband at 25/3 Mbps or higher or 10/1 Mbps or higher and no wireline voice), the FCC and the Rural Utility Service (RUS) of the United States Department of Agriculture are funding fiber-based and fixed wireless networks capable of providing up to 1 Gbps/500 Mbps to residential (including MDUs) and small business users. In October of this year, the FCC will make available up to \$16.0 Billion over ten years for broadband deployments in unserved rural areas via a reverse auction.

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"Residents in multi-unit buildings want access to ultra-high speed broadband service, and they want to be able choose among providers to get the best service at the best price. For the most part, building owners and managers work with their residents to provide this choice because they understand the importance of ultra-high speed broadband service."

TIMOTHY PAUL, President, Omnipoint Technology Inc.



We offer start to finish support and customize each network to the user's needs. Our services include:

- **Consultation:** Setup a free consultation to learn your needs and make sure our services are a great fit.
- **Design:** Our team of experts will design a custom solution that meets the owner and residents needs. We offer a variety of options from fiber-like speeds to every apartment all the way to community Wi-Fi.
- **Project Management:** We manage all aspects of the build from initial design through resident activation.
- **Construction:** Need a new dedicated fiber line to the property? Want new ethernet cables run to every unit? We've got you covered! We can even deploy small cell LTE to blanket your property and provide at-home LTE routers to your residents.
- **Support:** We offer ongoing support for management and residents including move-in, and move-out coordination, break-fix, tech support and more.
- **Computers:** We've got that too! Let us build a package that includes computers and internet as a bundle.
- **Internet:** Enjoy our high quality, high speed service at an affordable price with no data caps or strict Service Level Agreements.
- **Service Area:** Our teams travel to design, deploy and manage our networks anywhere in the US.

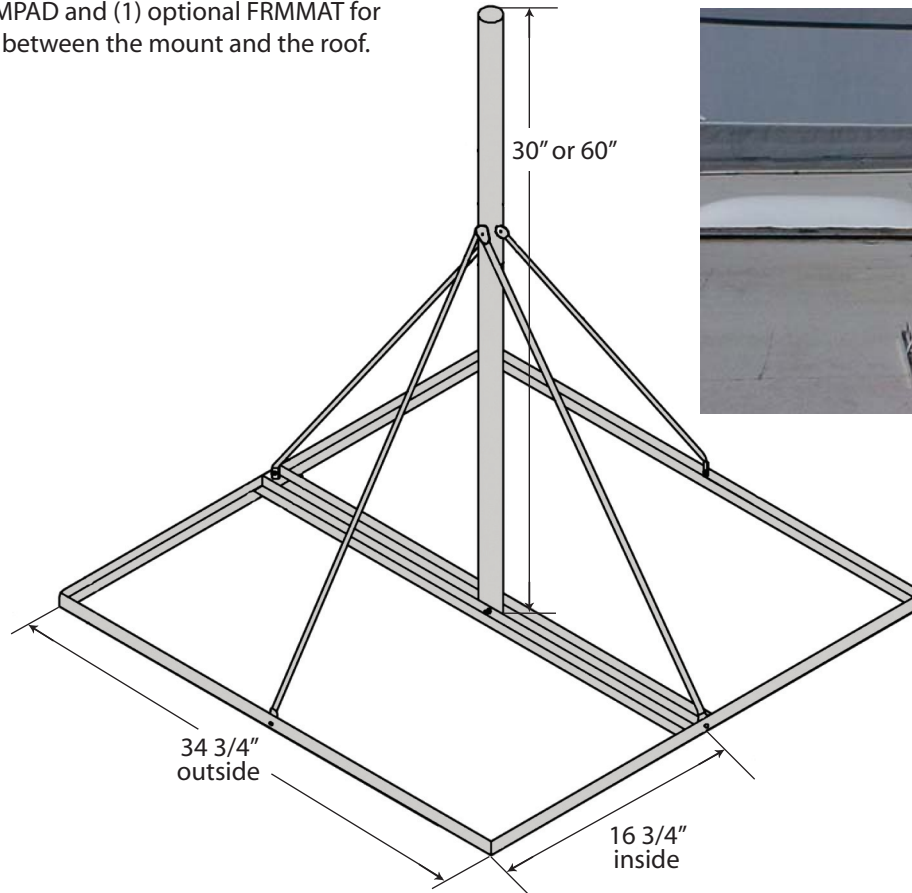




FRM

The FRM is a non-penetrating, ballast type roof mount that offers a 30" to 60" mast in sizes ranging from 1-1/4" to 2-3/8" O.D. The base of mount is 34-3/4" square with trays to fit the concrete blocks, typically used as ballast. The mount is galvanized for corrosion protection and goes together quickly.

Use (1) optional FRMPAD and (1) optional FRMMAT for a protective barrier between the mount and the roof.



MAST SPECIFICATIONS

Mount Part No.	Mast Part No.	Description
FRM125	FY202	Tube 1-1/4" x 16 GA. x 60" (PG)
FRM150	FY203	Tube 1-1/2" x 16 GA. x 30" (PG)
FRM166	FY204	Tube 1.66" x 16 GA. x 30" (PG)
FRM238	FY205	Tube 2-3/8" x 14 GA. x 30" (PG)
FRM225	FY205SP	Tube 2-1/4" x 14 GA. x 60" (PG)
FRM238SP5	FY205SP	Pipe 2"x SCH40 x 60" (HDG)

FRM ALLOWABLE ANTENNA AREAS

Effective Projected Area (EPA) (FT ²)	Ballast (LBS)	Zero Velocity Load (PSF)	(Sliding) Vs (MPH)	Vmax at centroid of projected area, (MPH) (Overturning)			
				h=2 FT	h=3 FT	h=4 FT	h=5 FT
2	100	12	140	135	110	96	85
	200	24	198	188	153	133	119
	300	36	242	222	182	157 (154)	141 (131)
	400	48	280	269	219 (197)	190	170
4	100	12	99	96	78	68	60
	200	24	140	133	108	94	84
	300	36	171	157	129	111	99 (93)
	400	48	198	190	155 (139)	134(109)	120
6	100	12	81	78	64	55	49
	200	24	114	108	88	77	68
	300	36	140	128	105	91 (89)	81 (76)
	400	48	161	155	127 (114)	110	98

NOTE: The velocities in () apply to the FRM125 mount when strength of the FRM125 mast governs. All other velocities are governed by overturning and apply to all FRM mounts. 27lbs.

H = Distance from support surface to centroid of EPA.

Vs = Effective wind velocity resulting in sliding on a flat surface with a .50 coefficient of friction.

Vm = Effective wind velocity based on strength or overturning.

Delivering Gigabit to the Home

Positron G.hn to Ethernet Managed Demarcation Point

**G1000-M****G1000-C**

“Fiber to the Home” is far from the only and most efficient technology to deliver Gigabit Internet access to subscribers. Retrofitting an existing (brownfield) Multi-Dwelling Unit (MDU) with fiber is complex and expensive. The G1000 series of G.hn to Ethernet Managed Demarcation Point devices complement the Positron G.hn Aggregation Multiplexer (GAM) family to deliver near symmetrical Gigabit Internet access to subscribers in MDUs over the existing telephone or coaxial infrastructure at a fraction of the cost of alternatives.

Introducing G.hn

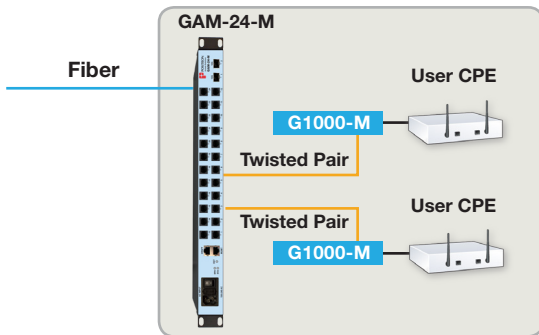
The ITU-T G.9960 G.hn Wave-2 standard is designed to leverage the existing telephone wiring (UTP, CAT-3 or CAT-5/5e) or RG-6/RG-59 coax cabling with an access technology that delivers a Gigabit Internet service to each subscriber at a lower cost and without the cost, complexity and delays associated with in-building fiber installation. G.hn is used as an Access technology by Operators looking to simplify their access network and backend infrastructure with an Ethernet-like technology that is highly scalable without some of the inherent complexity of DSL-related technologies. With G.hn as the Access technology, Operators deliver advanced services such as Gigabit High Speed Residential Internet and 4K IPTV without the high capital and operational expenses associated to a fiber retrofit. The Positron GAM solution is MEF CE 2.0 compliant and is ideally suited to deliver Business Ethernet services in an MDU and/or MTU deployment.

About the G1000 Managed Demarcation Point

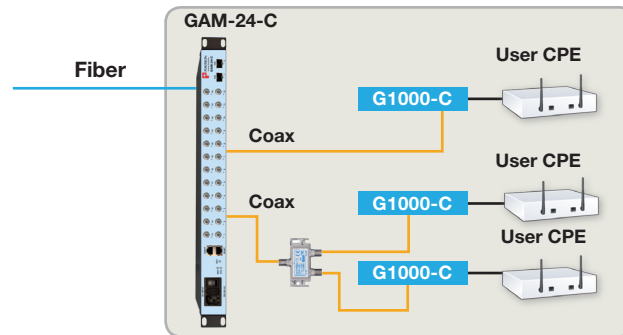
The Positron G.hn to Ethernet Bridge (G1000-M for twisted pair or G1000-C for coaxial) is a Managed Demarcation Point acting as a Virtual CPE (vCPE) that can be used to connect to a Residential Gateway (RG) that does not have native support for G.hn on its WAN port.

The G1000-M and G1000-C devices are used to control how a Residential Gateway (or User CPE) connects to the G.hn Access Network under the control of the Positron GAM. In this role, they make sure the information transmitted over the G.hn links is protected with strong AES-128 encryption. When used in Point-to-multipoint mode (coaxial wiring), the G1000-C operates under control of the GAM to isolate the traffic from each subscribers that share the same coax splitter.

MDU with Twisted Pair Infrastructure



MDU with Coax Infrastructure



Since the G.hn Access Network operates at layer-2 (same as Gigabit Ethernet and GPON), the G1000-M and G1000-C can operate under a virtual CPE (vCPE) mode when Operators rely on a Virtualized Network Function (VNF) architecture where services such as IP Routing and Firewall are handled by servers in the “cloud”.

About the Positron GAM

The Positron G.hn Access Multiplexer (GAM) family is designed to optimize coverage of Gigabit Internet services in an MDU. Operation over twisted-pair cabling is always Point-to-point. When operating over a coax infrastructure in Point-to-multipoint mode, it is possible to serve up to sixteen (16) G1000-C per G.hn port of the GAM.

GAM-12-M



GAM-24-M



GAM-12-C



GAM-24-C



Ordering Information

Part Number	Description
G1000-M	G.hn Wave-2 to Ethernet Bridge over Twisted Pair Multiple Input Multiple Output (MIMO) mode G.hn port (RJ14 port) Telephone port (via built-in POTS splitter) Two 10/100/1000BaseT RJ45 ports
G1000-C	G.hn Wave-2 to Ethernet Bridge over Coax G.hn port (F-type male connector) CATV port (F-type male connector) Two 10/100/1000BaseT RJ45 ports
GAM-12-M	12-port G.hn Access Multiplexer (GAM) for use over Twisted Pair wiring for 1 pair (SISO) or 2 pairs (MIMO) per RJ14 port
GAM-12-C	12-port G.hn Access Multiplexer (GAM) for use over Coaxial cable (F-Type male connector)
GAM-24-M	24-port G.hn Access Multiplexer (GAM) for use over Twisted Pair wiring for 1 pair (SISO) or 2 pairs (MIMO) per RJ14 port
GAM-24-C	24-port G.hn Access Multiplexer (GAM) for use over Coaxial cable (F-Type male connector)