

# COMVERGE

\ CREATING INTELLIGENT NETWORKS

## **Guidelines For FTTH Deployment In Greenfield Developments**

Head End Requirements

COMVERGE

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## 1. GLOSSARY OF TERMS

Abbreviation	Description
AC	Alternating Current
ACMA	Australian Communications and Media Authority
ACIF	Australian Communication Industry Forum
AS	Standards Australia
CA	Communications Alliance (formerly ACIF)
CCTV	Closed Circuit Television
CATV	Cable Television
DC	Direct Current
EPON	Ethernet Passive Optical Network
EPON-ONU	Ethernet Passive Optical Network – Optical Network Unit
FTA	Free-to-Air
FTTH	Fibre to the Home
GPO	General Power Outlet
GEPON	Gigabit Ethernet Passive Optical Network
HSD	High Speed Data
ICT	Information & Communications Technologies
IP	Ingress Protection
IP	Internet Protocol
IPTV	Internet Protocol Television
LAN	Local Area Network
MATV	Master Antenna Television
NAP	Network Access Point
NTD	Network Termination Device
ONT	Optical Network Termination
ONU	Optical Network Unit
OTDR	Optical Time Domain Reflectometer
PON	Passive Optical Network
PSTN	Public Switched Telephone Network
PSU	Power Supply Unit
PVC	Poly Vinyl Chloride (plastic)
RF	Radio Frequency
SATV	Satellite Television
SMOF	Single Mode Optical Fibre
VLAN	Virtual Local Area Network
VOD	Video On Demand
VOIP	Voice Over Internet Protocol
VPN	Virtual Private Network
VRF	Virtualised Routing & Forwarding
WSC	Wired Service Cupboard

## 2. OBJECTIVE

The objective of this document is to provide developers, builders and network owner/operators with basic guidelines and minimum Head End requirements to facilitate the connection to Comverge Networks Fibre-To-The-Home (FTTH) network architecture & services.

This document is for guidance where the developer, builder and/or network owner/operator intends to supply and install or make available a suitable Head End facility.

## 3. SCOPE

This document outlines the minimum requirements for a communications room designed to facilitate the installation of Comverge Networks FTTH Head End equipment. This Head End facility can be supplied in various forms: -

- A free standing purpose built communications room, designed and constructed to blend into the surrounding environment.
- A free standing purpose built communications shelter (a transportable walk-in shelter), designed and pre-fabricated as supplied by a number of specialised manufacturers.
- A purpose built communications room attached to another building with separate access.
- A dedicated communications room supplied within the confines of a shared community building.

## 4. INTRODUCTION

Comverge Networks will use FTTH technology to supply telecommunications services to the residents of Greenfield Developments, including single dwelling units, villas and town houses and high-density developments such as high rise apartments. Such services may include, but not limited to:

- (a) Voice - Telephony services, at a level of service comparable to that provided by a PSTN network (as offered by an Incumbent provider).
- (b) Data - High speed data connections to the Internet or to other private networks.
- (c) Video Services – including free-to-air terrestrial & satellite services, subscription television (pay television) and demand-based video services.
- (d) Other value-added services --- many other value-added services for an FTTH can be envisaged, such as: -

- Online Gaming
- Online Home Security
- Online Learning
- Teleconferencing
- Community Portal
- Telemedicine, Medical Imaging
- Remote Radiology and Specialty Consulting etc.
- Smart Metering
- CCTV
- Access Control

Therefore when considering the overall requirements for the Head End facility the developer, builder and/or network owner/operator will need to consider the type of development being constructed and the services to be offered over the FTTH infrastructure as these variants will all have a bearing on the overall design and size of the Head End facility.

It is therefore recommended that the developer, builder and/or network owner/operator engages Comverge Networks designers and engineers at the planning stages of the development to ensure that all current requirements are met and consideration is given to the potential expansion requirements of the development and/or network infrastructure.

#### 4.1 What is FTTH?

FTTH, or Fibre-to-the-Home, refers to fibre optic cable that replaces the standard copper twisted-pair wire of the local Telco running to the home. The fibre optic cable that runs to the building is similar to twisted pair cable in physical size but contains no metallic components. Also, only one such cable is required to supply voice, data and video services instead of two or more separate cables.

Fibre optic cable is less robust than twisted pair cable in terms of physical abuse, i.e., it must not be folded back, kinked or trampled on or the fragile glass fibre it contains may be permanently damaged and render it unusable.

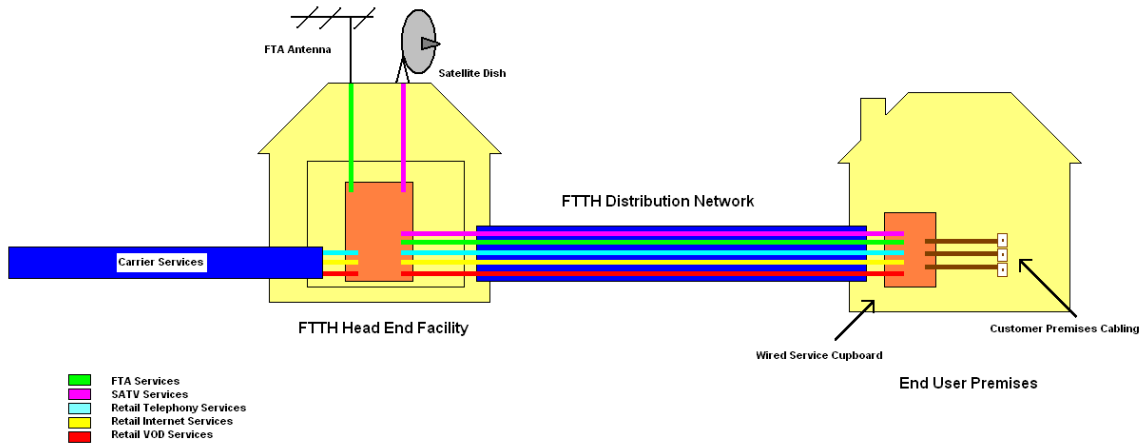
#### 4.2 Why Fibre & Fibre-to-the-Home?

There are a number of reasons to consider deploying fibre optic cable rather than copper:

- The lifetime costs for fibre optic are less than for copper-based systems, even though fibre optics may require a larger upfront investment. Typical aging lifespan of fibre optic cables is over 50 years.
- It's transparent with regard to data formats and data rates; therefore, to increase bandwidth the fibre optic cable does not have to be replaced, just replace the terminal equipment. This is a very important issue from the point of view of life cycle costs as well as persistence of the technology.
- Only fibre optic cable can “truly” reach the 50-1000 Mbps and beyond to support a full-range of applications:

- Copper supports voice and data services, but cannot “adequately” support Cable TV/Video services.
  - Wireless can support data services, and voice services that are compromised in quality – but cannot support Cable TV services.
  - Coax can support Voice over IP services, data, and Cable TV services – but that’s it. No other additional service is able to run on it.
- 
- Fibre optic cable is less susceptible to electrical interference from power lines and spurious radio signals and immune from lightning-induced surges.
  - Attenuation (or signal loss) for fibre optic cable is several orders of magnitude less than any other broadband technology, thereby significantly reducing the need for expensive signal regeneration equipment and/or amplifiers.
  - Fibre optic cable offers: -
    - Higher Bandwidth
    - Lower Latency (i.e., delay)
    - Lower Bit Error Rate

## 5. MINIMUM REQUIREMENTS



**Figure 1: Typical Delivery Model of Comverge Networks FTTH Services**

## 5.1 Head End Facility

Ideally, the Head End equipment would be located in a suitable purpose built communications room attached to a shared community building with separate access or a dedicated communications room supplied within the confines of a shared community building such as a club house or community centre with a minimum dimension of 4m x 3m x 3m.

Alternatively a free standing purpose built communications room, designed and constructed to blend into the surrounding environment may be supplied with a minimum dimension of 4m x 3m x 3m.

If either of these facilities is not available or will not be available until later in the project, a communications shelter (a transportable walk-in shelter) needs to be provided by the developer, builder and/or network owner/operator to house the Head End equipment. The recommended room dimensions are 4m x 3m x 3m

If a communications shelter is used, relevant council permits may need to be obtained by the developer, builder and/or network owner/operator.

With either the communications room or communications shelter the developer, builder and/or network owner/operator needs to provide suitable Mains Power, Air Conditioning, Uninterruptible Power Supply (UPS) and Back-up Generator, if required.

Fencing may also need to be considered for security and aesthetics.



**Figure 2: External View of a typical Communications Shelter**

Where the developer, builder and/or network owner/operator opts for the supply of a dedicated communications room supplied within the confines of a shared community building, consideration must be given to the access of this facility as this will be required 24 hours a day, 7 days a week and 365 days a year for emergency fault restoration.

If the shared community building does not offer this accessibility then arrangements will need to be put in place to facilitate access for Comverge Network technicians at all times to undertake their duties to meet Service Level Agreements (SLA's) and legal obligations.

## 5.2 Head End Security Requirements

An access control system will be installed by Comverge Networks within the FTTH Head End facility for the security of the building and the Head End equipment.

Consisting of: -

- Key pad entry and fob entry.
- Internal key pad for arm and disarm.
- PIR's, door reeds, smoke detectors, heat detectors.
- Door reeds on rack doors with striker locks for restricted access.
- Break exit glass.
- Internal siren, external siren and strobe.
- Monitoring of security system by monitoring station and/or NOC (if required).

The access control system will be an IP based system to integrate with the data network for remote access and monitoring.

Internal and external (entrance and back-up generator compound) cameras installed with mini DVR system also IP based for remote access and monitoring.

## 5.3 Head End Equipment

### ***Uninterrupted Power Supply***

Where the developer, builder and/or network owner/operator intends to supply and install or make available a suitable Head End facility, Comverge Networks requires the installation of suitable uninterrupted power supply(s) (UPS).

It is recommended that the UPS(s) have a single phase output and either a single phase or three phase input. The positioning and installation of the UPS(s) is shown in the following diagram "Figure 3: Typical FTTH Head End Floor Plan".

Comverge Networks recommends that each UPS has an Intellislot network card providing SNMP based or WEB-management communication capability for connection to a Network Management System. As an example, for a load of 10kW, a Liebert NXf15kVA (12kW) is suggested in a single module configuration (non redundant).

The UPS will have 2 strings of 40 HRL 1234 VRLA batteries to provide approximately 20 minutes of autonomy for a 12kW load. The UPS(s) will need to be sized for different room sizes and loads dependant on the FTTH Network requirements.

### ***Redundant UPS Option***

Comverge Networks would recommend the installation of a redundant UPS and would suggest the installation of 2 Liebert NXf15kVA (12kW) UPS's or similar in an N+1 configuration to support the total load of 10kW. The Liebert NXf15kVA (12kW) UPS has a 3-phase input and 1-phase bypass and output.

***Back-Up Generator***

Where the developer, builder and/or network owner/operator intends to supply and install or make available a suitable Head End facility, Comverge Networks requires the installation of a suitable Back-Up Generator.

Based on the above mentioned UPS solution, for either the redundant or non redundant options a back-up generator capacity requirement of over 72kVA standby capacity is required for the site location. As such an FG Wilson 88kVA, 3-phase standby generator set or similar is recommended.

Note that all UPS options are configured for a single phase output, meaning the generator will be oversized to cater for the scenario when the UPS transfers the load to the bypass supply.

Comverge Networks would also recommend that the standard factory sound attenuated canopy is installed which should be rated for 71.1dBA @ 7m.

***Temperature Control***

Where the developer, builder and/or network owner/operator intends to supply and install or make available a suitable Head End facility, Comverge Networks requires the installation of a suitable Air Conditioning System to maintain a temperature controlled environment.

In a typical FTTH Head End facility with an anticipated IT heat load of 12kW, including the heat load from 1+1 UPS, 2x Liebert PEX P1020UA up flow air cooled DX CRAC units are recommended, which are capable of providing up to 18.3kW net sensible cooling capacity based on an assumed 24°C/45%RH on coil conditions and 36°C ambient. A factory matched condenser unit is also recommended to suit.

Each PEX would come with an Intellislot network card providing HTTP browsing, SNMP and WEB-management capability for connection to a Network Management System. Additionally, floor stands are included to allow piping and electrical connection and plenums to direct the conditioned air towards the front of the Head End communications racks.

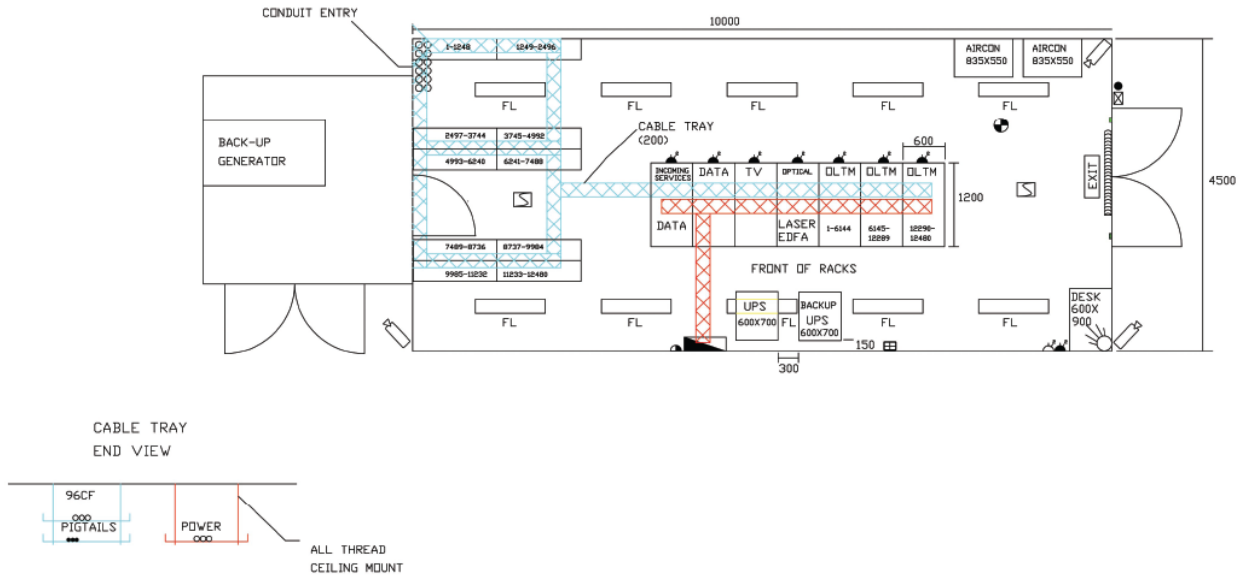
All Liebert PEX air conditioners employ split coil configurations, allowing latent cooling capacity to be substantially increased, but only as required, so that energy consumption is minimized whilst providing close temperature and humidity control. Smaller heater size and unit full load amps (FLA) lowers electrical connection requirements and reduces installation costs.

***Lighting & Emergency Lighting***

Where the developer, builder and/or network owner/operator intends to supply and install or make available a suitable Head End facility, Comverge Networks requires the installation of a suitable lighting and emergency lighting.

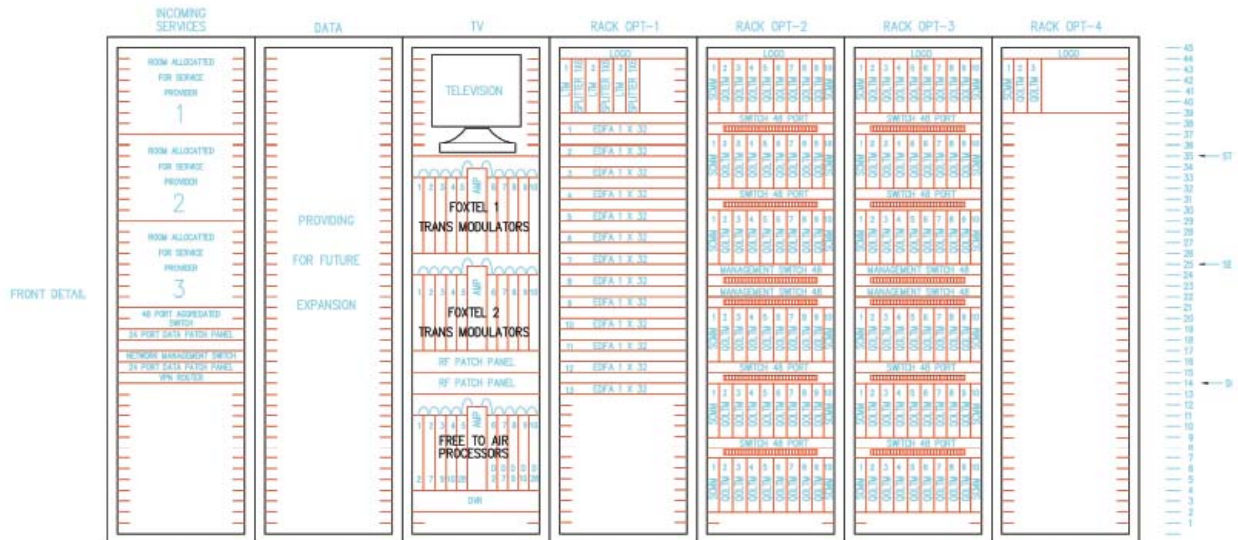
Comverge Networks requires the lighting to consist of adequate fluorescent lights (recessed if required). An illuminated exit sign and emergency back up lighting. An external motion sensor light for both the entrance and back-up generator area, where required.

The following figure shows a typical Comverge Networks FTTH Head End floor plan showing proposed equipment layout.



**Figure 3: Typical FTTH Head End Floor Plan**

The following figure shows a typical Comverge Networks FTTH Head End rack layout.



**Figure 4: Typical FTTH Head End Rack Layout**

#### 5.4 FTTH Satellite Farm

- If the developer is mandating an Antenna and Satellite dish free environment in the Greenfield Development, a suitable site needs to be allocated to locate the Master antenna and 90cm-120cm satellite dishes.
- Ideally, this could be on the roof or adjacent to the building where the Head End is located.
- If this facility is not available a suitable Satellite Farm needs to be provided.
- All the satellite dishes (FTA and/or Pay TV) can be located at a place “almost invisible” from the residential area.
- Fibre optic cable will be used to connect the Satellite Farm to the Head End equipment for distributing various channels throughout the estate.
- The Satellite Farm can be with a single dish for a specific service or multiple dishes for multiple services as shown in the following figure. Typically a site would have a dish each for FoxTel/Austar & SelecTV one for free to air satellite such as BBC World and/or an ethnic channel and one for initial internet broadband if required.



Figure 5: Typical Satellite Farm

## 6. STANDARDS & CODES TO FOLLOW

All works MUST be undertaken in accordance with and conform to the various applicable Australian/New Zealand and International Standards and Codes Of Practice. These include but are not limited to: -

Document Number	Title
AS/ACIF S009	ACMA Wiring Rules
AS/NZS 2053	Conduits and Fittings for Electrical Installations
AS/NZS 3000	Electrical Installations (known as the Australian/New Zealand Wiring Rules)
ACIF C524	Industry Code of Practice – External Communication Cable Networks
AS HB29	Communications Cabling Manual

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