



FOXTEL MANAGEMENT PTY LIMITED

**Satellite Installation Manual – SIM
for**

**Multi-Dwelling Units
Multi-Residential Estates and
Commercial Installations**

FD/T/E/2207

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Document Control

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Summary of the Satellite MDU Specification in this Manual

The FOXTEL Standard is for a 4 cable backbone (5 cables if integrated with Open Broadcast (OB) television), with two laterals to every outlet. All designs will use RG6 cabling. The details for implementing the specifications are presented in this manual.

There are four categories by building type:

- **New** (planned or under construction now)
- **Existing unwired** (no FOXTEL related wiring)
- **Existing wired** (with a single FOXTEL related backbone) – which are classified as 'Lite' or 'Extra Lite' backbone and require upgrading to the latest specifications.
- **Double Backbone with Single Lateral** – These sites require an upgrade to twin laterals.

The summary specification for wiring existing wired MDU modules is:

- Install a dish with at least a quad LNB with lead-in cables and then for:
 - i. Integrated with the OB cable – requires a 5 cable backbone. This type of installation requires the cascading taps to be connected to at least one 5-input multiswitch on each floor.

The fifth cable on the 5-input multiswitch carries the OB signal which will require one lateral to every outlet on the floor. (There is negligible cost in installing additional laterals to every outlet at this time, but this is an optional extra for the Body Corporate to consider.)

Any unused outputs from both multiswitches are to be terminated at the multiswitch.
 - ii. Standalone: (no OB cable) – requires a 4 cable backbone. This type of installation requires the cascading taps to be connected to at least one 5-input multiswitch on each floor – unused outputs from this multiswitch are to be terminated at the multiswitch.

National Broadband Network (NBN)

The NBN will not be carrying FOXTEL and O.B (FTA) RF audio-video services on the NBN backbone.

It is recommended that two backbones are installed to cater for all services:

1. Backbone for FOXTEL and O.B Services
2. Backbone for NBN services.

Note: FOXTEL specifies in this document that 2 x cat6 cables should be installed adjacent to the FOXTEL wallplate. These cables can be used for an ethernet connection to FOXTEL or O.B and can also be used to deliver NBN or other services.

Terminology

The following list provides standard terminology for referring to satellite installation configurations irrespective of whether an Open Broadcast system is available in the building:

- *Non-compliant:* there is no FOXTEL compliant cabling in the building.
- *PDR Compliant:* a distribution system that can support FOXTEL services without cabling upgrades over the life of the C1 and D3 satellites and two outlet ports to support up to four tuners in the STU to enable programme recording. It consists of:
 - A satellite dish with at least a quad output polarity LNB
 - All four LNB RF outlets connected to the building distribution system
 - Four quad RG6 cables to each multiswitch (backbone)
 - Two quad RG6 (or greater) cables going from the end of line multiswitch to each twin wallplate
 - An ethernet outlet should be incorporated into or adjacent to the twin wallplate (two Cat6 cables)

1. Purpose

In recent years FOXTEL has launched new channels, interactive services and products (such as Near Video On Demand, Multiview, Personal Digital Recorders) that required changes to FOXTEL installation techniques. The new services use the vertical and horizontal polarities of the satellite. Therefore, new FOXTEL SMATV systems require more sophisticated multiple backbone and twin lateral cabling systems so that the new services and products can be distributed to the subscriber's home.

The purpose of this manual is to:

- Outline the specifications for designing installations to FOXTEL's expectations
- Provide the **knowledge** necessary to appreciate the complexities of satellite distribution installations.

From time to time, the requirements within this manual will change as the FOXTEL business matures. This could be due to introduction of new technology or identification of field difficulties, which require clearer detail to ensure the quality expectations of the business are met. Changes will be distributed via electronic field bulletins or listed on the FOXTEL website.

2. Scope

This manual applies to all entities associated directly or indirectly with providing FOXTEL satellite connectivity to potential subscribers. In this manual, these entities are referred to as Clients.

This manual is only relevant to satellite installations and is divided into sections applicable to distinct audiences.

- Section 4 is applicable to third party installation companies. It describes how to request a FOXTEL installation.
- Section 6 contains design guidelines and is applicable to FOXTEL Industry Designers.
- Section 8 contains installation requirements as well as technical reference and troubleshooting information.

Note: FOXTEL expects that all FOXTEL Industry Designers, contracted installation technicians and quality audit inspectors involved in satellite installations will be able to understand the information within this manual, comply with the requirements described, and have the skills and abilities required to perform the work. If additional information is required for simple domestic installations then this may be found in FOXTEL's Satellite Installation Manual – Domestic (SIM-DOM).

3. Feedback

Questions, noted inconsistencies or suggestions for improvements to this manual can be emailed directly to FOXTEL at installation.solutions@FOXTEL.com.au.

4. Requests for a FOXTEL Installation

4.1. Creating the Conceptual Design

An accurate initial assessment of the building is one of the most important aspects of the overall build process as this will assist in creating a conceptual design that is suitable for the building.

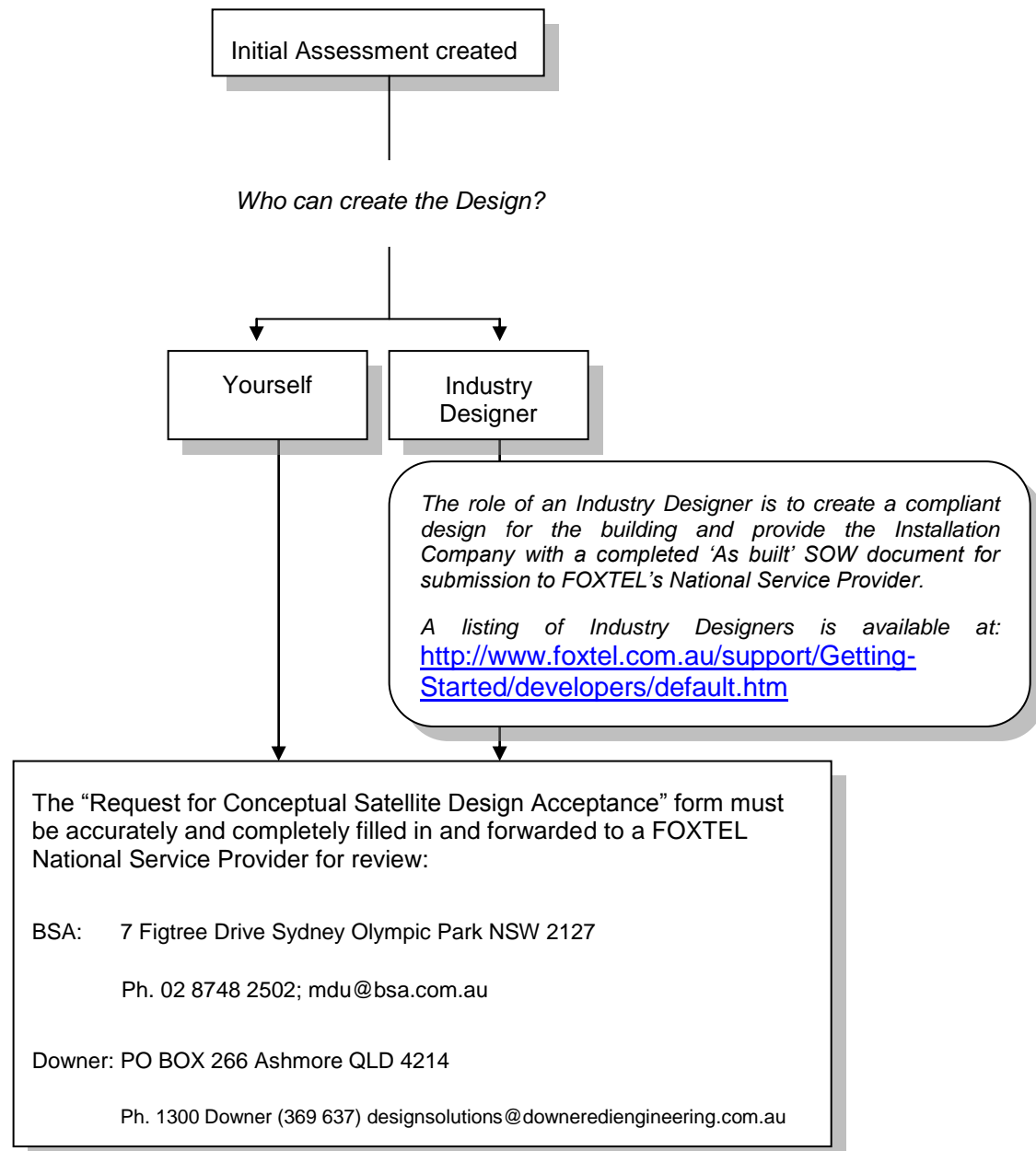


Figure 1 – Conceptual Design Process

4.2. Request for Conceptual Satellite Design Acceptance Form

FOXTEL Request for Conceptual Satellite Design Acceptance				
Installation Company Details:				
Company Name:		Date Submitted:		
Contact Person:		Email Address:		
Phone Number:		Fax Number:		
Building Information:				
Building name: <i>(optional)</i>				
Street address: <i>(optional)</i>				
Suburb: <i>(optional)</i>				
New or existing build:		New <input type="checkbox"/>		Existing <input type="checkbox"/>
Number of buildings in complex	Distance between buildings	Number of floors	Distance between floors (equipment locations)	Number of units per floor
Total units in complex	Number of wallplates per unit	Distance dish to 1st device (equipment location)	Lateral shortest distance (riser to unit)	Lateral longest distance (riser to unit)
Acceptance Request Checklist:				
Building checked?:		(please tick) <input type="checkbox"/>		
Line of Site available?:		<input type="checkbox"/>		
Twin cables to required wallplates?:		<input type="checkbox"/>		
Cables wired to required wallplates?:		<input type="checkbox"/>		
All cables in units run to common location?:		<input type="checkbox"/>		
<i>Common locations being Riser, MDF room, Electrical riser etc.</i>				
Conceptual design attached to this request form?:		<input type="checkbox"/>		
<i>eg. AutoCAD, MS Visio or hand drawn sketch.</i>				
Conceptual design meets 2005 specification?:		<input type="checkbox"/>		
<i>If no provide explanatory notes below</i>				
Comments (explanatory notes):				
FOXTEL National Service Provider Use Only				
Provider Details:				
Provider Name:		Request Reference No:		
Contact Person:				
Phone Number:		Conceptual Design Accepted?		
Email Address:		Yes <input type="checkbox"/> No <input type="checkbox"/>		
		Date of Review:		
Comments (explanatory notes):				

Ensure all details on the form are correctly completed

In the Comments field provide a concise scope of works which may include:

- If Open Broadcasting system (i.e. FTA) is to be integrated
- If cable will be run in cavity, risers or externally in ducting
- Any unique aspect relative to the building that will assist in the design process.

Upon receiving an accepted "Request for Conceptual Satellite Design Acceptance" form back from a FOXTEL National Service Provider, you may then provide a quotation to the client and if successful with your quotation, begin the installation works.

5. Quality Control

FOXTEL's quality expectations and processes focus on ensuring that the design and field installation process is positive and beneficial to everyone involved in the FOXTEL process and that they will happily recommend the FOXTEL process to others.

FOXTEL, or one of our National Service Providers, reserve the right to actively inspect the work performed by Third Parties to ensure that their work meets the required standards. If subsequently the work is found to be of an inferior standard then the Third Party installer will be required to make the necessary reparations.

6. Design Guidelines

This section outlines the requirements for companies designing FOXTEL satellite installations.

6.1. Outdoor Unit (ODU) – Dish and LNB

This section details the steps required to select and install the satellite dish and LNB.

6.1.1. Dish Selection

The step of selecting the correct dish performance is to ensure that it will provide appropriate increase in margin of Bit Error Rate, Modulation Error Ratio (in band noise ratio) and Digital Channel Power performance to ensure it will cater for rain fade margin and distribution system degradation. Figure 2 provides information on the six satellite coverage zones and the appropriate size dish required for an installation at this location.

Foxtel Coverage Map based on Optus C1 Satellite

Minimum Domestic Dish Sizes based on Technical Performance

Zone 1	60CM
Zone 2	65CM
Zone 3	80CM
Zone 4	85CM
Zone 5	85CM
Zone 6	1.2M

Availability	Average Yearly Outage (Hours)
99.0%	87.6
99.1%	78.8
99.2%	70.1
99.3%	60.5
99.4%	56.6
99.5%	43.8
99.6%	35.0
99.7%	26.3
99.8%	17.5
99.9%	8.8
99.95%	4.4

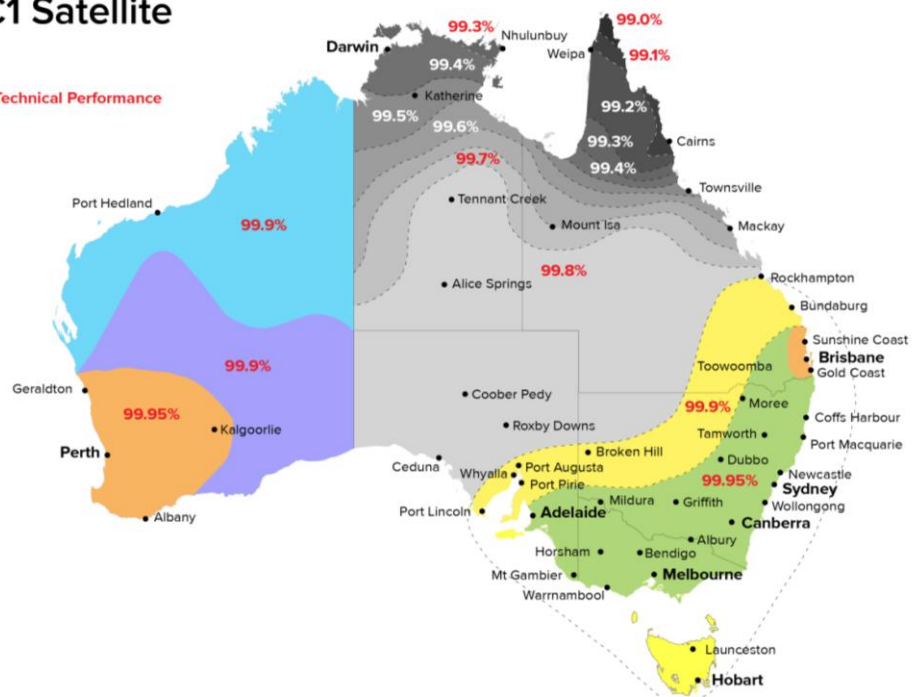


Figure 2 – Optus C1 FOXTEL Satellite Coverage Zone Map

Table 1 – Dish Location Zone to Size Selection Matrix

	MDU ≤ 3 Stories	MDU ≥ 3 Stories	MRE	Commercial (hotel –MDU)	Commercial (single Dwelling)
Zone 1	65cm	90cm	90cm	90cm	65cm
Zone 2	85cm	90cm	90cm	90cm	85cm
Zone 3	80cm	90cm	90cm	90cm	80cm
Zone 4	85cm	1.2m	1.2m	1.2m	85cm
Zone 5	80cm	1.2m	1.2m	1.2m	80cm
Zone 6	1.2m	1.5m	1.5m	1.5m	1.2m

6.1.2. Dish Alignment

There are two steps to aligning a satellite dish for optimum performance, Azimuth elevation setup and cross-polarisation. A meter must be used for all dish alignment (see Installer Product List for current models). FOXTEL has selected these new meters to make the dish alignment process more accurate and efficient. See Section 8.1.2 for step by step installation procedures.

6.2. Mounts

This section describes how to select a mount and where to install it.

Note: No mount is to exceed its maximum rated dish size or wind rating specifications. All mounts must be installed in accordance with the manufacturer's instructions.

Note: For further information on mount specifications and details, refer to the Domestic Installation Manual – (Satellite Installation Manual – Domestic (SIM-DOM)) or the Manufacturer's instructions provided with the mount, or refer to the Manufacturer's website.

6.2.1. Mount Selection

When selecting a mount, it needs to be suitable for the size of the dish and the prevailing wind conditions in the area where it will be used. Australia can be divided into four regions for prevailing wind conditions:

Region A: Normal

Region B: Intermediate

Region C: Tropical cyclones

Region D: Severe tropical cyclones

Use Table 2 below and the map in Figure 3 to select the appropriate mount for the location. For further clarification on the suitability of the mount required for your location in all regions, contact the mount manufacturer.

Refer to the manufacturer's website for further information relating to mount selection to suit the dish size used in your region.

Jonsa Australia: <http://www.jonsa.com.au/>

Hills Antenna & TV Systems <http://www.hillsantenna.com.au/>

Mount Wind Rating

Mounting hardware for the installation of satellite dishes on domestic dwellings must have a wind rating that complies with the requirements of *AS 4055-2012 Wind loads for housing*. In particular the Wind Rating of the mount together with the dish must comply with or exceed that set out in Table 2.2 of *AS 4055-2012* for the local Wind Region and site conditions. The Wind Rating of a mount in combination with the dish is specified in the mount manufacturer's installation instructions.

As a guide, the Wind Ratings in the corresponding Wind Regions as listed in Table 2 below are considered to be suitable for satellite dish mounting hardware unless the site is on a hill or slope.

These Wind Ratings apply to all sites within a Wind Region except where the house or MDU is located on the mid or top third of a hill, ridge or escarpment of average slope greater than 1:20 (3°).

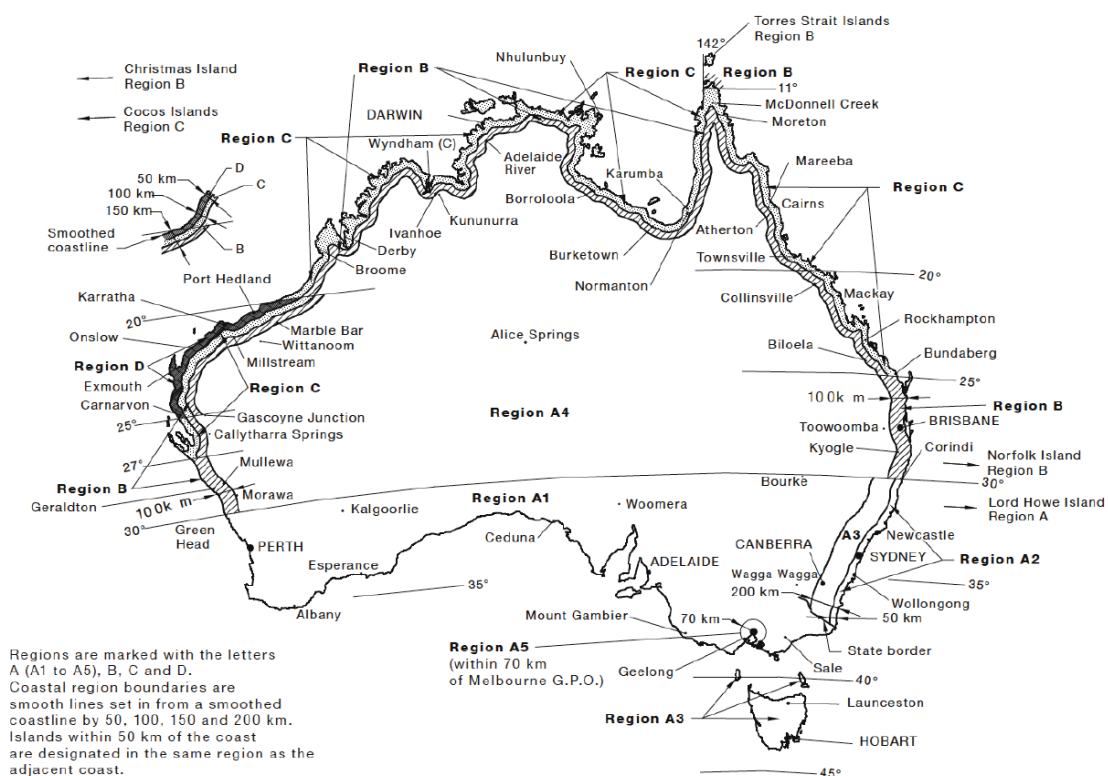


FIGURE 3.1(A) WIND REGIONS

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This is an extract from AS/NZS 1170.2:2011, this standard can be purchased online at <http://www.saiglobal.com>

Figure 3 – Wind Regions

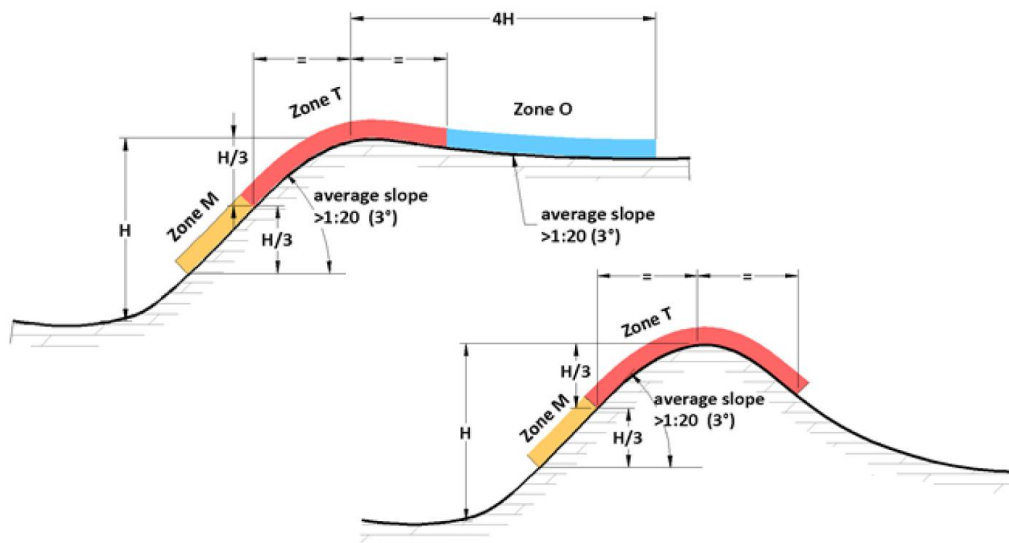
Table 2 – W1 Mount Selection – Wind Rating Chart

Minimum Wind Rating	Region A		Region B		Region C		Region D	
Building Type	Wind Rating	Hill Index	Wind Rating	Hill Index	Wind Rating	Hill Index	Wind Rating	Hill Index
Domestic dwelling	N3	H1	N4	H3	C3	H5	C4	-
MDU, up to 3 storeys	N3	H2	N4	H8	C3	H10	-	-
MDU, 4 storeys	N3	H7	N4	H8	C3	H11	-	-
MDU, 5 to 6 storeys	N3	H7	N4	H9	C4	H6	-	-
MDU, 7 to 14 storeys	N3	H7	N5	H4	C4	H6	-	-

Where no Wind Rating is shown in Table 2, wind conditions are likely to be extreme, and expert advice should be sought from the local building authority.

Higher Wind Ratings are applicable to hill tops and slopes

For sites located in the zones marked M, T and O in the diagrams below, it may be necessary to use a higher wind rating.


Figure 4 – Hill Zones

Estimate the height and slope of the hill and the relative position (Hill Zone) of the site to determine the Exposure Classification (T number) using Figure 4 above and Table 3 below.

Then use the Hill Index from Table 2 and the Exposure Classification from Table 3 to determine the Rating Increment from Table 4 below.

Add the Rating Increment to the Minimum Wind Rating from Table 2 to find the Wind Rating applicable to the site.

Table 3 – Exposure Classification

Exposure Classification	Hill Zone M	Hill Zone T			Hill Zone O
Average Hill Slope		H less than 10m	H between 10 & 30 m	H more than 30m	
1:20 to 1:10	T0	T1	T1	T1	T0
1:10 to 1:7.5	T1	T1	T2	T2	T0
1:7.5 to 1:5	T1	T2	T2	T3	T1
1:5 to 1:3	T2	T2	T3	T4	T2
>1:3	T2	T3	T4	T5	T3

Table 4 – Rating Increment

Rating Increment	Exposure Classification					
Hill Index	T0	T1	T2	T3	T4	T5
H1	0	0	+1	+1	+1	+2
H2	0	0	+1	+1	+2	+2
H3	0	0	+1	+1	+2	-
H4	0	0	+1	+1	-	-
H5	0	0	+1	-	-	-
H6	0	0	-	-	-	-
H7	0	+1	+1	+1	+2	+3
H8	0	+1	+1	+2	+2	-
H9	0	+1	+1	+2	-	-
H10	0	+1	+1	-	-	-
H11	0	+1	-	-	-	-

For example, a 4 storey MDU located half-way up a 50 metre hill with a slope of 1:10 in Region B has a minimum Wind Rating of N4 and a Hill Index of H8 (Table 2). It is situated in Zone M according to Figure 4. Its Exposure Classification according to Table 3 is T1 (take the worst case for the slope). By Table 4, the Rating Increment is +1. Therefore the Wind Rating for the site is $N4 + 1 = N5$.

Where no Rating Increment is shown in Table 4, wind conditions are likely to be extreme, and expert advice should be sought from the local building authority.

Note: *Refer to manufacturer for appropriate mount.

Refer to the following Australian Standards and Codes.

Wind class and wind speed have been upgraded from the specified region categories listed in the standards.

- AS/NZS1170.0:2002 Structural design actions Part 0: General Principles
- AS/NZS1170.1:2002 Structural design actions Part 1: Permanent imposed and other actions
- AS/NZS1170.2:2011 Structural design actions Part 2: Wind actions
- AS4055-2012 Wind loads for housing
- AS4100-1998 Steel structures
- AS1720.1-2010 Timber Structures Part 1: Design methods
- AS1684-2010 Residential timber framed construction
- AS3700-2001 Masonry Structures

Note: No allowance has been made in structural design to comply with the provisions of *AS/NZS1170.3:2003 Snow and ice actions* or *AS/NZS1170.3:2007 Earth quake actions*

Important Note: For installations in the Northern Territory where different regulations apply, refer to the Building Notes on Satellite Dishes: http://www.lands.nt.gov.au/_data/assets/pdf_file/0003/8193/45.pdf

6.2.2. Location of Mount

For the FOXTEL satellite installation to work correctly there must be a clear Line of Sight to the FOXTEL satellite. Locations with a limited Line of Sight can result in intermittent or complete loss of signal. There should be no obstructions, for example, trees or parts of buildings in the signal path. An inclinometer should be used to survey the signal path to ensure a clear Line of Sight. If there is any uncertainty as to whether the Line of Sight will remain clear in the future (due to vegetation growth), use a different mount location.

6.2.3. Mount and Dish Placement

Placement of the mount for the dish on a building is aesthetically important and an essential part of the design for all existing buildings. A photo of the proposed mount/dish location is to be added to the Scope of Work document, thus ensuring the Client, for example, the Body Corporate, knows where the dish will be located before they sign off on the Scope of Work and design. Figure 5 provides guidance on the preferred mount and dish location where number 1 is the most preferred location (towards back of building) and 4 (front/side of building) is the least preferred option.

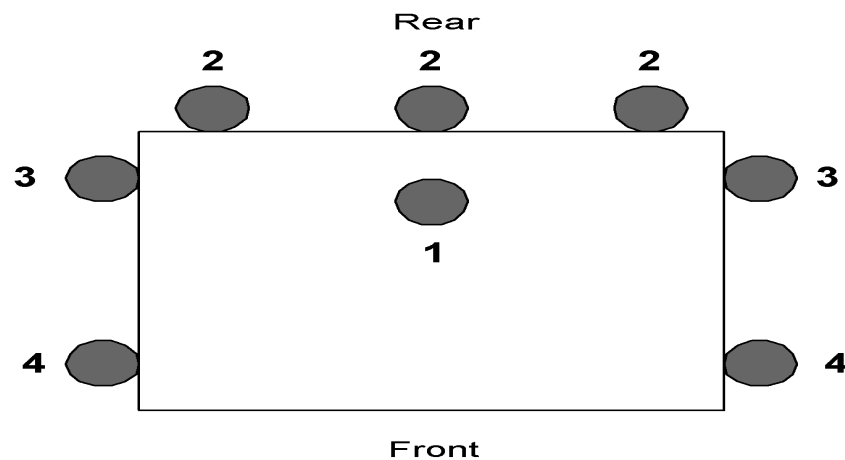


Figure 5 – Preferred Dish Locations

Note: The dish should not be located at the front of the building unless it has been clearly identified in the Scope of Work documentation submitted to the Body Corporate (or equivalent).

Note: Where the mount is installed on either a pre-cast concrete slab, block or wall, or a pre-mixed concrete slab, block or wall, the mount anchorage points must be greater than 300mm from any corner or edge of the slab, block or wall.

6.3. Roofing

Where necessary, clip-lock tin roof sheets (on flat roofs) may be removed for running cable through roof. If removed, ensure the roof sheet is re-clipped back into its original position.

CAUTION: Any damage caused through this action remains the responsibility of the Contracting company and/or the Customer Service Technician.

If sarking (water resistant foil membrane used for insulation) needs to be penetrated, carefully cut the sarking along the joist and repair using sarking tape.

6.4. Distribution System

This section describes requirements for installing cabling from the dish to the twin wallplate in a range of installation types:

- Multi-Dwelling Unit Installations:
 - Small
 - Large
- Multi-Residential Estates:
 - Coaxial
 - Fibre
- Commercial installations:
 - Hotel RF integration
 - High rise buildings
 - Single Dwelling Residence.

Example designs for these installation types are provided in Section 7.

6.4.1. Cabling System Topologies

There are typically only two types of cabling system layouts or topologies, Home Run (star wired) and Cascaded Taps (directional couplers – tree and branch). In reality, there is a third system, which uses Home Run and Cascaded Tap systems together, known as HRCT hybrid. FOXTEL recommends the Home Run system be used with all commercial Single Dwelling Residences and Small MDUs with the hybrid system being used with MDUs, Multi-Residential Estates and commercial high-rise buildings.

6.4.1.1. Home Run

The Home Run is the simplest installation and commonly used in small buildings (generally less than 4 storeys in height). Quad cables must be run from the wallplate to an area that provides future accessibility, for example, building service riser, communication riser or structured services cupboard.

6.4.1.1.1. Home Run LNB to First Device

A minimum of four (4) cables are to be run from the quad LNB to the first device (multiswitch or power injector) then earthed and terminated using an appropriate device, for example, four barrel grounding block.

6.4.1.2. Cascaded Tap

FOXTEL has migrated from the old legacy compliant distribution network which only used the Cascaded Tap standard. All new PDR compliant and MDU future compliant installations can only use either the Home Run or HRCT hybrid configuration.

Note: The use of single input taps is not recommended.

6.4.1.3. HRCT Hybrid

The HRCT hybrid is a more complex installation and has to be used in larger buildings (greater than 12 units). FOXTEL requires that a minimum of four cables be run between the headend and each cascable tap, which supplies each Home Run node. The major advantage of the HRCT hybrid system is that a modular approach can be used when designing and cabling a building. For more information on the HRCT hybrid design, refer to Section 7 or a FOXTEL Industry Designer.

6.4.2. Other Subscription Broadcast Provider Boundary Issues

1. Under no circumstances are you to use another Subscription Broadcasting provider's cable in total or in part.
2. Another carrier's outlet should not be used regardless of whether it is active or inactive.

6.4.3. Cable Selection

The appropriate cable for the installation environment should be used, for example:

- Underground installation – cable with flooding compound
- Aerial installation – cable with inbuilt messenger
- Common areas requiring fire retardant cable – plenum type cable (fire-rated) as required.

6.4.4. System Earthing

All FOXTEL installations incorporating two or more wallplates or STUs must be earthed. Systems with only a quad LNB must have an 4 barrel grounding blocker fitted. SMDUs and MDUs must have all amplifiers, power injectors, multiswitches, splitters and/or taps to be earthed as per Section 7.2.5.

6.4.5. System and Wallplate Specifications for Installations

Note: FOXTEL requires all system and wallplate performance testing to be carried out with a meter listed in the Installer Product List and that readings within a system comply with those in Table 5, Table 6, Table 7 and Table 8. If any wallplate performance is substandard, troubleshooting will be required to rectify the fault. To aid in future maintenance and installation problem solving, all active equipment and wallplates are to be tested and documented using the Commissioning Form found in the SOW Document.

Table 5 – Wallplate Digital Performance

Broadcast type		Bit Error Rate		Modulation Error Ratio <i>(In band noise ratio)</i>
<i>Standard</i>	<i>Modulation Type</i>	Pre-Viterbi	Pre – RS or Post-Viterbi	Minimum (dB)
DVB-C	64 QAM		<2E-7	30
DVB-C	256 QAM		<2E-7	36
DVB-S	QPSK	<2E-4	<2E-7	12.5 ⁺
DVB-T	COFDM 64 QAM	<2E-4	<2E-7	24
Analogue	RF Integrated Channels Terrestrial OB	–	–	SNR >43 dB

Note: ⁺ Clear sky weather conditions level.

Table 6 – Wallplate Signal Level

Broadcast Type		Wallplate Level (dBμV)			
		Commercial Single Dwelling Residence (SDR) ONLY		Multi-Dwelling Unit, Multi- Residential Estate and Large Commercial Systems >20 RF Channels	
<i>Standard</i>	<i>Modulation type</i>	Min	Max	Min	Max
Analogue	FM radio	45	80	54	71
Analogue	RF Integrated Channels Terrestrial OB	60	86	60	77
DVB-C	64 QAM	N/A	N/A	56	70
DVB-C	256QAM	N/A	N/A		
DVB-S	QPSK	58	79	58	76
DVB-T	COFDM 64 QAM	40	75	54	77
T-DAB	COFDM QPSK	50	80	45	67

Note: All digital levels are RMS voltage or Digital Channel Power. Digital Channel Power measured values may be +/- 2 dB from the levels listed due to accuracy of meters.

Table 7 – Wallplate Digital Slope / Tilt Performance

Broadcast Type		Wallplate Level Slope Tilt (dB)	
<i>Standard</i>	<i>Modulation Type</i>	Maximum level difference at single wallplate	Maximum level difference ALL wallplates in system
Analogue	RF Integrated Channels Terrestrial OB	6	12
DVB-C	64 QAM	6	12
DVB-C	256 QAM	6	12
DVB-S	QPSK	12	18
DVB-T	COFDM 64 QAM	6	12

Note: Measured values may be +/- 2dB from the levels listed owing to accuracy of meters.

Table 8 – Post Installation Certification Test Locations

Broadcast Type		Test Locations	
<i>Standard</i>	<i>Modulation type</i>	<i>Amplifiers</i>	<i>Multiswitches and wallplates</i>
Analogue	RF Integrated Channels Terrestrial OB	All channels	Low and High channels (all RF integrated Channels)
DVB-C	64 QAM	All carriers	7 carriers
DVB-S	QPSK	7 Transponders	7 transponders
DVB-T	COFDM 64 QAM	All channels	Highest and lowest channels

6.4.6. Placement of Equipment / Devices

All active equipment must be located in common accessible areas, for example, in communications equipment room/communication riser or cupboard.

All end of line equipment must be installed in a position which will allow a 'standard connection' to the wallplate. (See definition below.)

Placement of end of line devices

When the multiswitch is installed within a LU, the end of line devices are to be placed in a dry accessible location for future servicing. Typically this can be in a hub area within the kitchen.

External cables may be installed and enclosed within ducting/conduit as a last resort.

For buildings which have flat tin or concrete roofs with no common roof areas, a weather resistant housing (aluminium colourbond or UV stable plastic) may be

installed under the eaves or in a common area to house the multiswitch and provide mechanical protection as well as an aesthetically pleasing finish.

A 'standard connection' may be defined as:

- One where the lateral cables from the multiswitch to the wallplate are less than 40 metres
- A connection utilising existing cavities/ communications equipment room/ communication riser or cupboard /roof space and preferably not externally run using ducting/conduit.

Where exposed interior cabling will be present, up to 4-5 lengths of conduit/ducting may be used to complete the installation.

- One which excludes the creation and repair of plaster wall/ceiling access holes within the unit.

6.4.7. Cable Pathways

For new developments using conduit from the communications riser to the wallplate, a 25mm diameter conduit is to be used. When more than two wallplates are located in a unit, it is recommended that a minimum of four cables be run from the riser to a communication cupboard in the unit from which all cables from each wallplate are connected.

6.5. Post Installation

At the completion of installation, an approved 'as built' SOW document should be forwarded to FOXTEL to enable the building to be activated for the FOXTEL service.

Note: The National Service Provider submits an electronic copy of the 'as built' Scope of Work document to FOXTEL.

6.5.1. Installation 'As Built' Drawings

The installation company is to clearly mark the original FOXTEL design to accurately show all the equipment that has been installed in the system, including changed system calculations. Where the design has been modified, the modified design is re-submitted to Designer for the completion of an electronic 'as built' design.

Note: It is highly recommended that As Built drawings show system calculations throughout the design to facilitate commissioning and troubleshooting.

A copy of the design shall, where possible, be left next to the headend. Refer to Figure 11 – 4 Storey Design, for full system calculation requirements.

6.5.2. Installation Photographs

Photographs may be provided as appropriate for:

- Dish location – showing skyline and weather conditions
- Dish; LNB; Mount – close up photo
- Headend site
- Multiswitch location(s) showing communications riser and earthing.

6.5.3. Installation Certification Testing

Post installation testing involves completion of a commissioning sheet with Digital Channel Power, Modulation Error Ratio and Bit Error Rate levels by the installation company. All tests must comply with the wallplate specifications for installations tables and be documented on the As Built SOW. Testing by data logging an installation is also acceptable.

6.5.3.1. LNB Tests

LNBS must be tested by the installation company for Digital Channel Power, Modulation Error Ratio and Bit Error Rate for the following Transponders (as a minimum).

C1	D3
T14, T20	T10, T12, T14, T18, T22, T24

6.5.3.2. Amplifier Tests

All amplifiers must be tested by the installation company for Digital Channel Power, Modulation Error Ratio and Bit Error Rate for Transponders as per Section 6.5.3.1 (as a minimum). This will ensure all satellite transponders are being received to specification.

6.5.3.3. Multiswitch and Wallplate Tests

All multiswitches and wallplates must be tested for Digital Channel Power, Modulation Error Ratio and Bit Error Rate for Transponders as per Section 6.5.3.1 (as a minimum). This will give a good indication of the reception performance of all satellite transponders.

Note: If access to all wallplates in the MDU is not possible, testing should be undertaken at each multiswitch and at the nearest and farthest end of line wallplate.

7. Sample Designs

This section presents the basic design requirements for a FOXTEL installation. It contains an overview of the essential elements of an installation and contains samples of typical designs for different types and sizes of FOXTEL installations. For specific installation requirements, FOXTEL recommends always using a FOXTEL Industry Designer to create the design for each individual installation.

7.1. Design Essentials

All Third Parties involved in FOXTEL satellite installations need to be aware of a number of design essentials for both SMDU and MDU installations.

7.1.1. Small MDUs

A small MDU is classified as a small block of units, typically three levels or less with no riser or common power available to power the multiswitch.

- In circumstances where there is no common power to the multiswitch, a two input multiswitch may be used where the multiswitch and LNBF can be powered from the STB
- All wallplates installed during an installation are to be twin (not single) wallplates
- An ethernet outlet should be incorporated into or adjacent to the twin wallplate (two Cat6 cables)
- Two cables are to be run from each twin wallplate to a multiswitch
- All LNB outputs are to be connected to the first device (multiswitch)

Note: If O.B. services are distributed on the same backbone, an active 5 wire multiswitch and GPO must be installed to cater for system losses. (Refer to Figure 9)

7.1.2. MDUs

- All wallplates installed during an installation are to be twin (not single) wallplates
- An ethernet outlet should be incorporated into or adjacent to the twin wallplate (two Cat6 cables)
- Two cables are to be run from each twin wallplate to a multiswitch
- A four cable backbone is to be installed for stand-alone FOXTEL installations
- A five cable backbone is to be used where FOXTEL is integrated with terrestrial signals (O.B. – FTA)
- An amplifier is generally required every 4-8 floors
- All LNB outputs are to be connected to the amplifier.

7.2. Typical Designs

The following typical sample designs cover small to large installations and are categorised into the following:

- Small Multi Dwelling Unit
- Large Multi-Dwelling Unit
- Multi-Residential Estate
- Commercial - Single Dwelling Residence, hotel (RF integration) and business high rise buildings

7.2.1. Small Multi-Dwelling Unit Designs

7.2.1.1. 4 Units, 4 Twin Wallplates

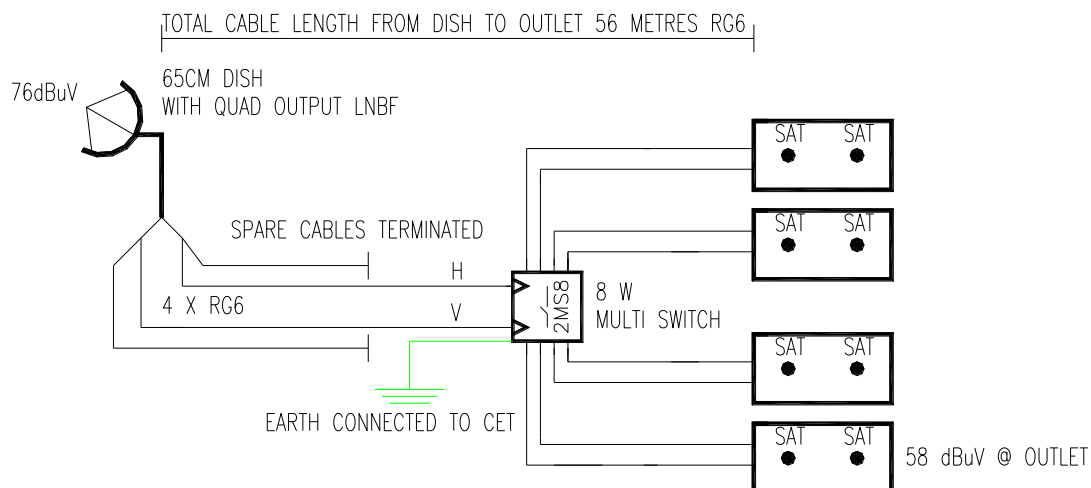


Figure 6 – MS1–4–1 (4 Personal Digital Recorder)

Note: Total allowable cable length may change dependant on the LNB / multiswitch gain and location of installation.

7.2.1.2. 6 Units, 6 Twin Wallplates

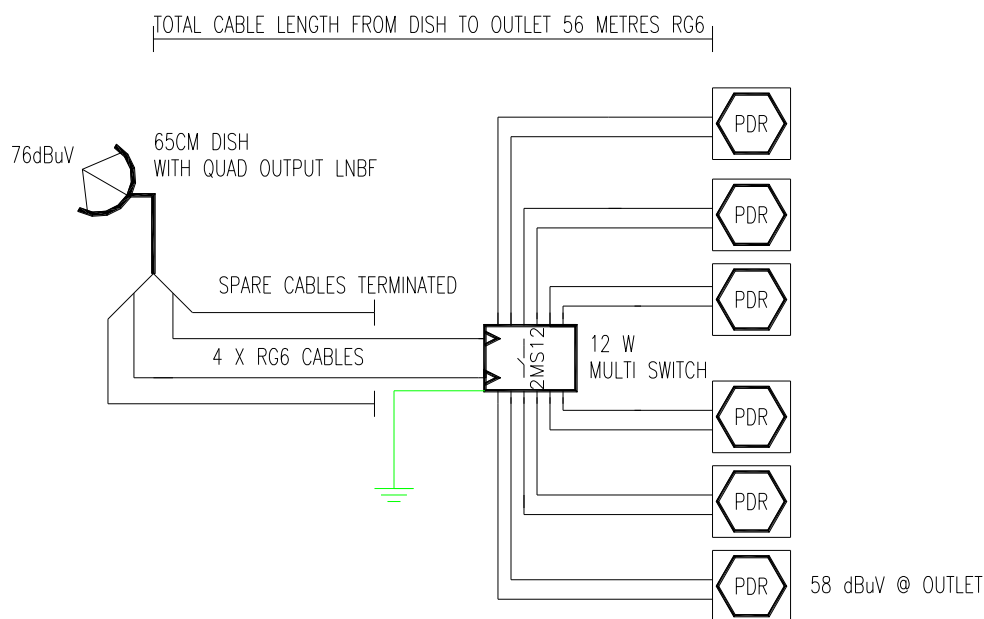


Figure 7 – MS1–12–1

Note: Total allowable cable length may change dependant on the LNB / multiswitch gain and location of installation.

7.2.1.3. 8 Units, 8 Twin Wallplates

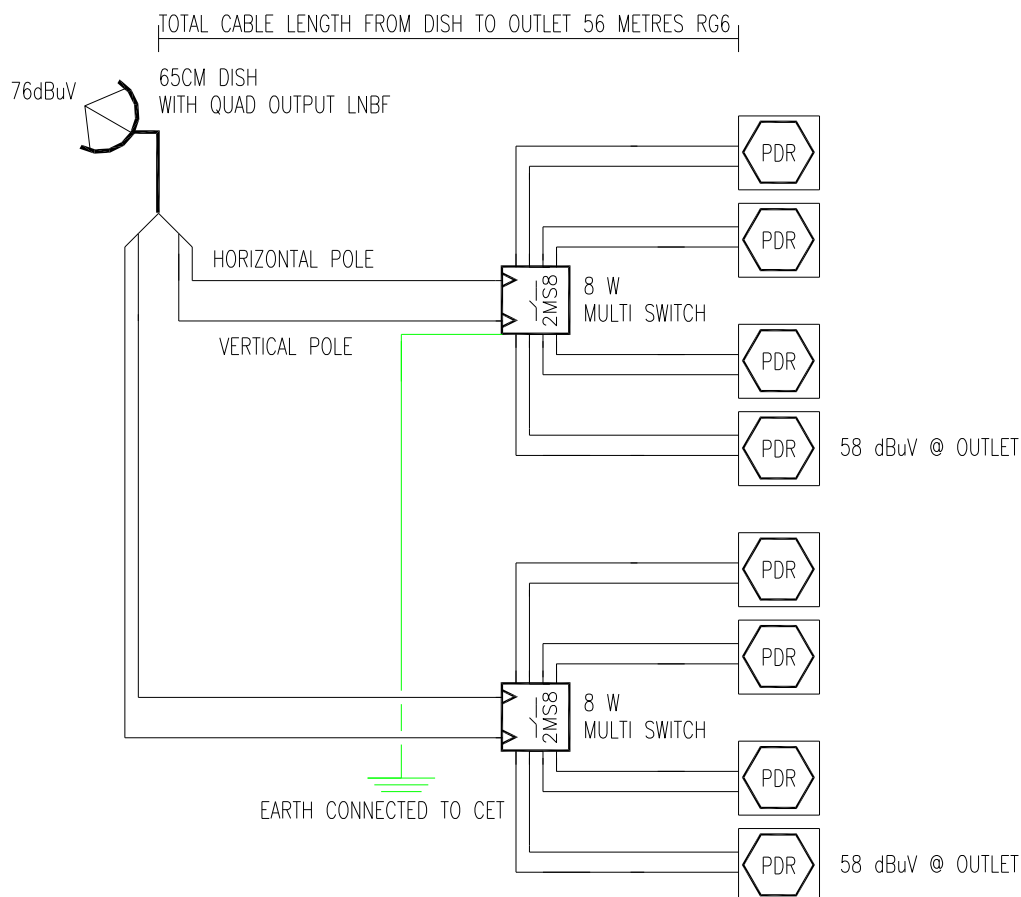


Figure 8 – 8 Units, 8 Twin Wallplates

7.2.1.4. 8 Units, 8 Twin Wallplates with Active Multiswitch

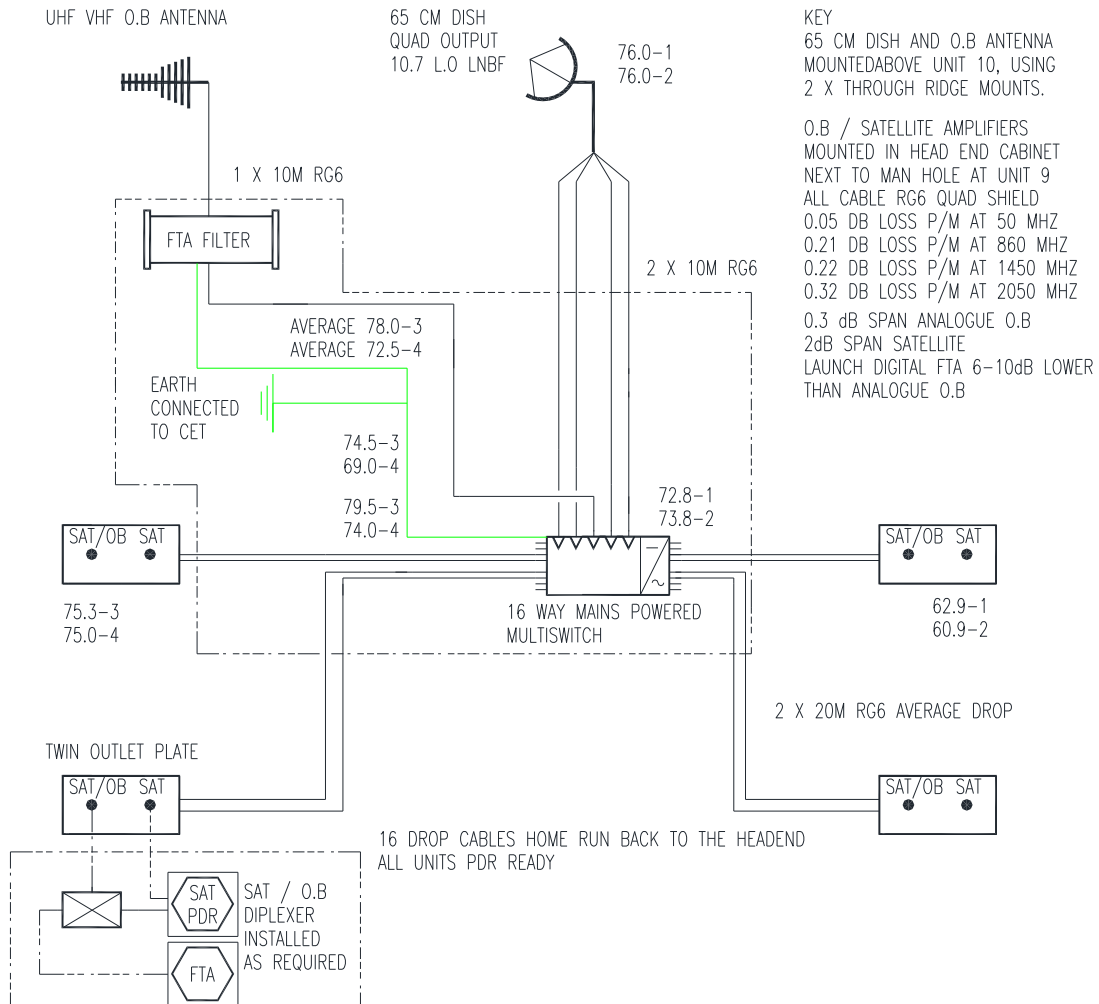


Figure 9 – MS06-1

7.2.2. Multi-Dwelling Unit Designs

7.2.2.1. Townhouse Villa Buildings (Satellite and OB)

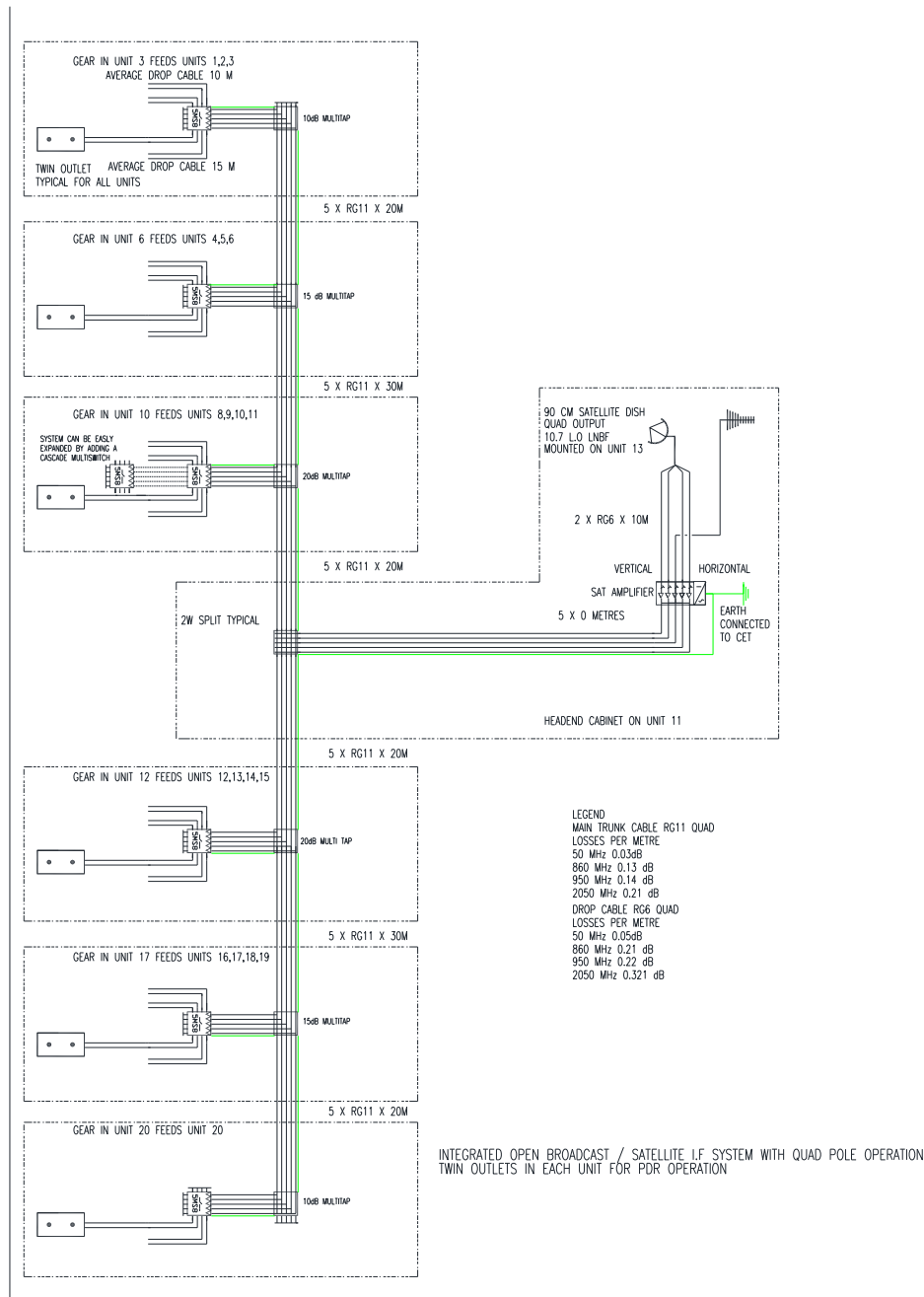
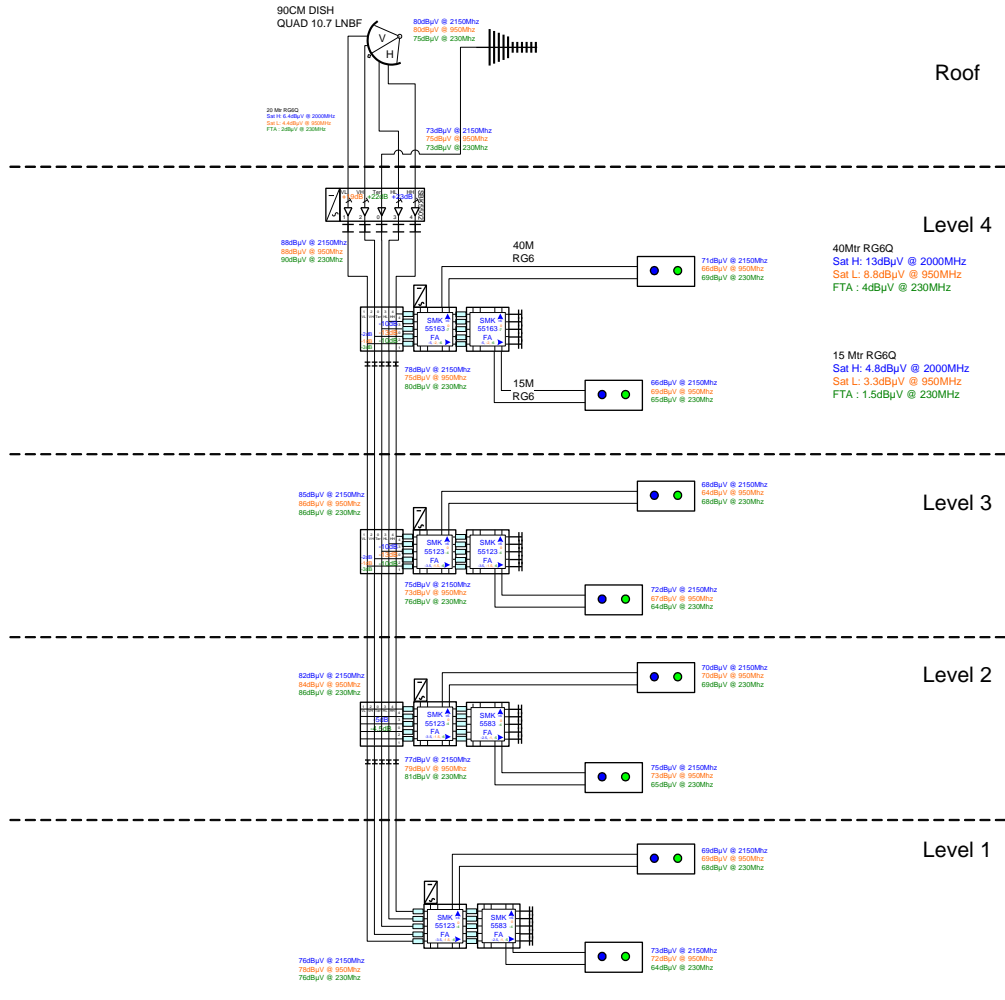


Figure 10 – MS01–1

7.2.2.2. 4 Storey Building, 32 Twin Wallplates Integrated Satellite and OB to Cascade 5 Wire Multiswitches



Notes:
All figures shown on this design are in dBμV.
Calculations based on RG6 coaxial cable using the following frequencies and colour coded accordingly.
Sat High Band - 2000MHz
Sat Low Band - 950MHz
FTA - 230MHz
The system is to be earthed in accordance with AS1367:2007
All unused ports to be terminated with 75 ohm loads.

Figure 11 – 4 Storey, 32 Twin Wallplates Integrated Satellite and OB to Cascade 5 wire Multiswitches with System Calculations

7.2.2.3. 8 Storey Building, 96 Twin Wallplates (Satellite only)

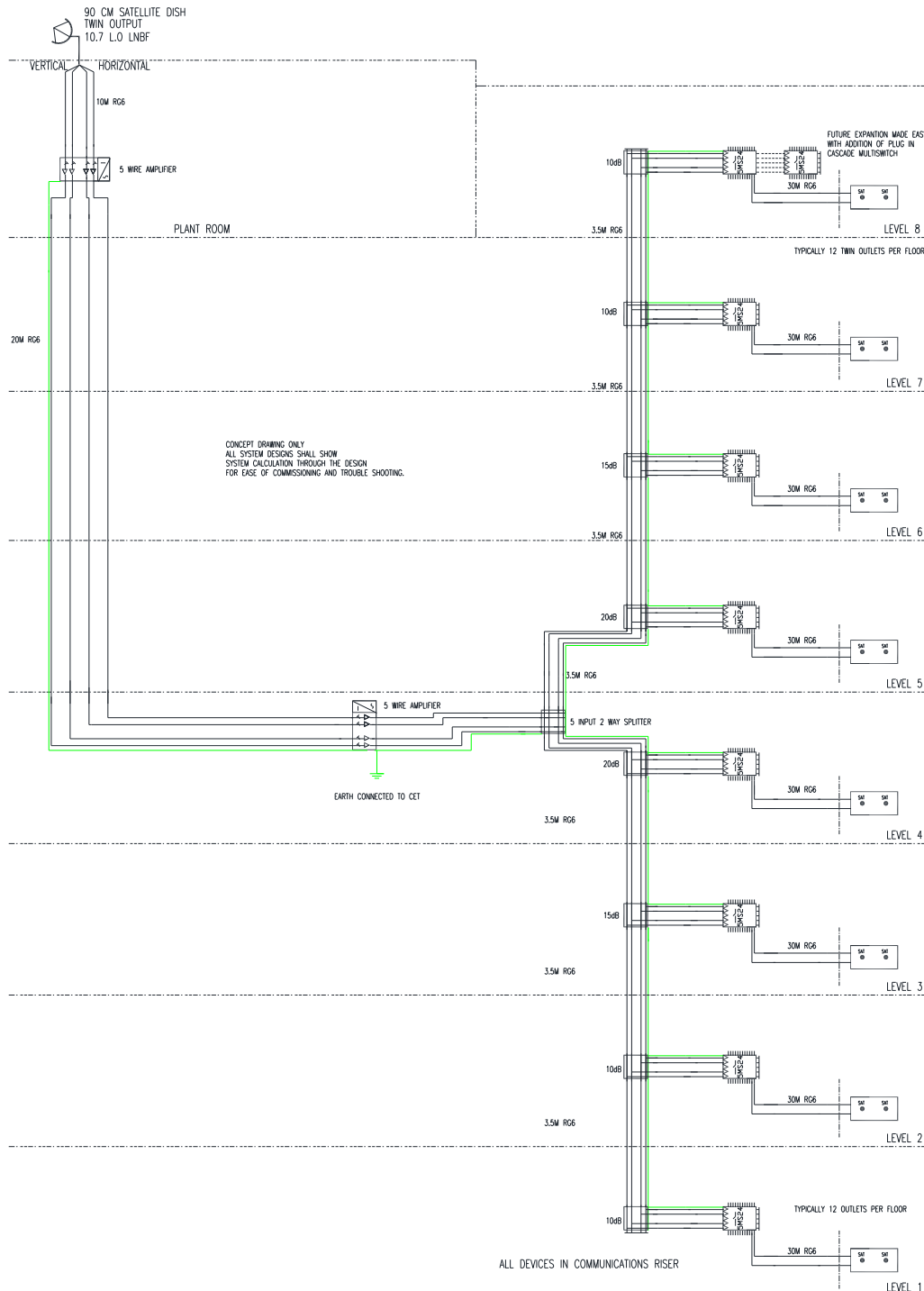


Figure 12 – MS08–2A

7.2.3. Commercial Designs

7.2.3.1. Single Dwelling Residence – Single Wallplate

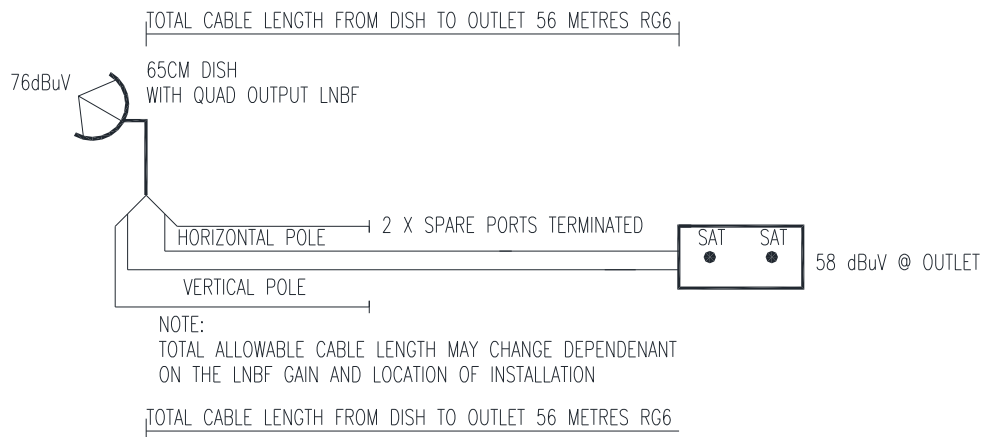


Figure 13 – MS1–4–1 (1 Personal Digital Recorder)

Note: Total allowable cable length may change dependant on the LNB gain and location of installation.

7.2.3.2. Single Dwelling Residence – Single 2 x Wallplates

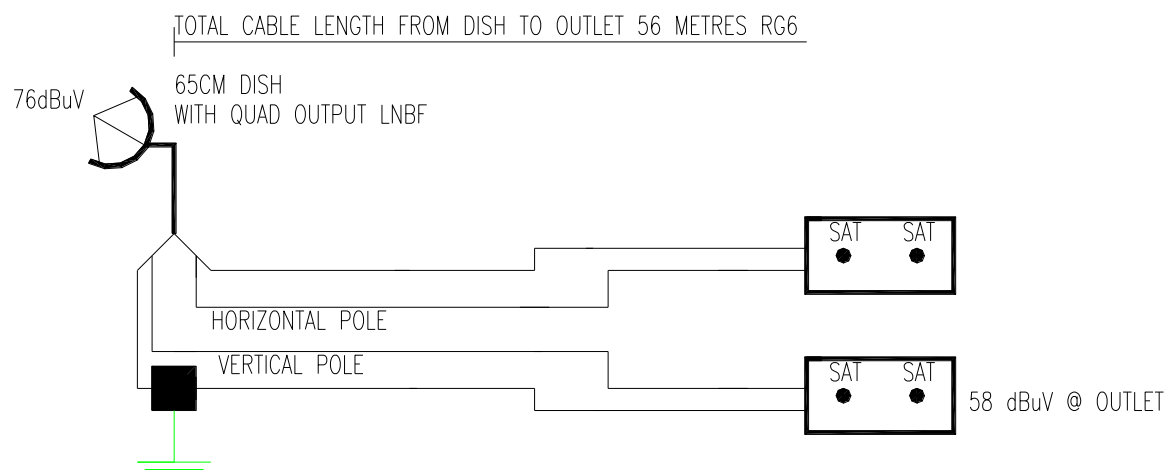


Figure 14 – MS1–4–1 (2 Personal Digital Recorder)

Note: Total allowable cable length may change dependant on the LNB and location of installation.
Earth connected to CET via 2GHz grounding block.

7.2.3.3. 9 Storey High Rise Building (one off install)

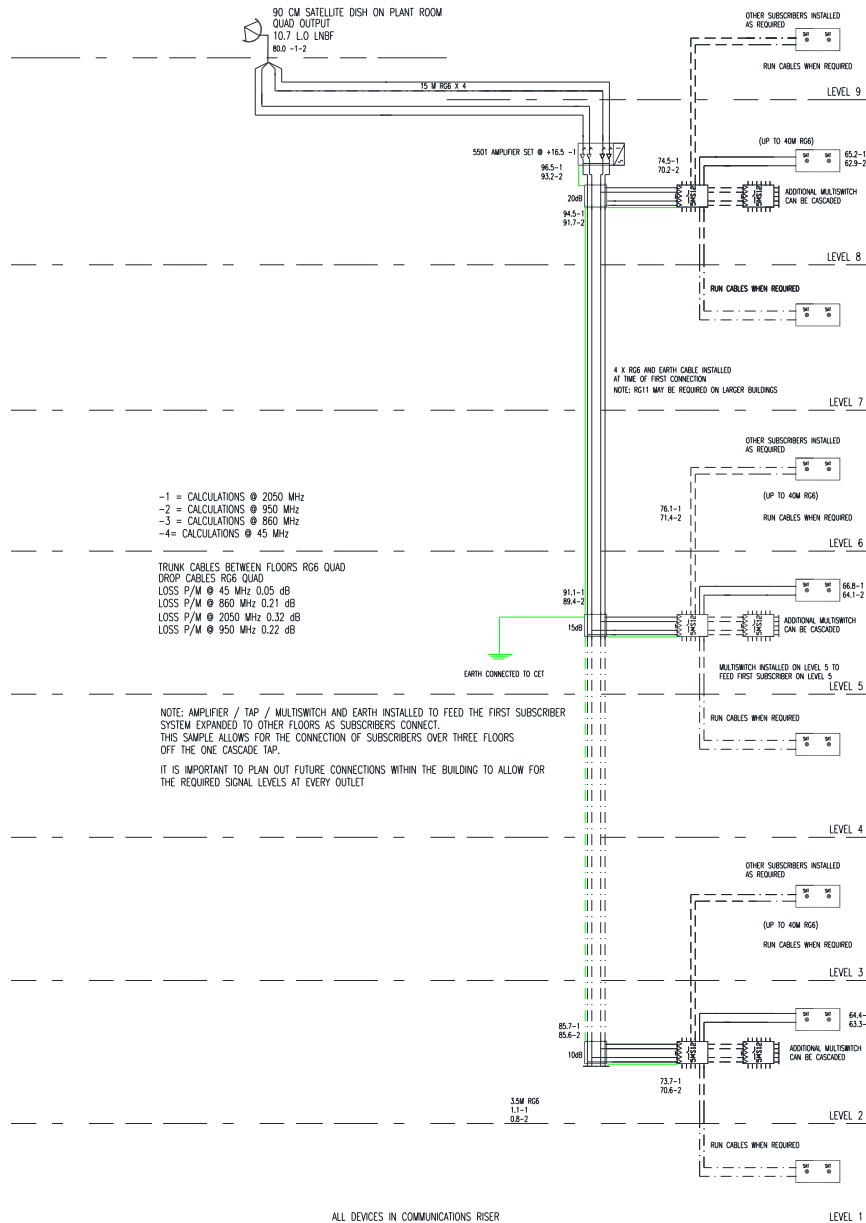


Figure 15 – MS08-3A

Note: Amplifier / tap / multiswitch and earth installed to feed the first subscriber. System expanded to other floors as subscribers connect. This system allows for the connection of subscribers over three floors from the one cascade tap. It is important to plan out future connections within the building to allow for the required signal levels at every outlet.

7.2.3.4. Hotel RF Integration

This section describes the minimum requirement for the integration of FOXTEL in a commercial premise via the output of the Set Top Unit. Single channel amplifiers are recommended on the existing Open Broadcast (OB) headend and FOXTEL headend to minimise the chance of interference from unwanted carriers.

To reduce the chance of ingress, existing cables must be at least RG59 dual shield. If new cables are required we recommend that RG11 quad shield is used for trunk cables, and RG6 quad shield for drop cables.

7.2.3.4.1. Satellite Feeds to STU

Installation of satellite feeds to the STU shall be as per Section 6 for small or large MDUs. The STU outputs are then to be modulated onto different frequencies for distribution through the MATV system (see Figure 17, Figure 18 and Figure 19).

7.2.3.4.2. MATV RF Integration

Typically, MATV systems are only designed to distribute approximately 10 OB channels. The following items must be checked at time of site survey and documented in the Scope of Work:

- Television tuner performance
- Amplifiers (type and output levels)
- Number of channels to be integrated and bandwidth requirements.

7.2.3.4.3. Television Tuner Performance

Inspect television type(s) and document manufacturer and model in Scope of Work.

Test tuners capability by using a modulator. Proposed integration frequencies may not operate correctly on hotels televisions. Check to see if mono or stereo modulators are required.

7.2.3.4.4. Amplifier Performance

Document amplifier type as well as input and output of existing amplifiers in MATV system in the Scope of Work documentation.

The Industry Designer is to use the information from the Scope of Work to calculate whether existing amplifiers and television tuners will operate to FOXTEL wallplate performance specifications as detailed in Table 5, Table 6, Table 7 or Note: Measured values may be +/- 2dB from the levels listed owing to accuracy of meters.

Table 8 with the proposed additional frequencies to be integrated into the MATV system.

7.2.3.4.5. Bandwidth, Additional Channel Loading

During site visit, if proposed frequencies are higher than those currently distributed in the MATV system, a modulator (STU RF output) needs to be temporarily integrated, and signal level performance needs to be tested at each end of line wallplate locations at the extremities of the distribution network.

Document the room number and level for all channels in the Scope of Work documentation.

Figure 16 shows the sticker which is placed on all STUs in commercial installations to facilitate troubleshooting over the phone by the FOXTEL Technical Support Team. The sticker shows which channel the STU is tuned to, and the output of the STU.



Figure 16 – Technical Support Sticker

7.2.3.4.6. RF Integration

The preferred method of RF integration is the use of modulators.

Modulators for RF integration include:

- VSB modulators (mono)
- VSB modulators (stereo)

7.2.3.4.7. FOXTEL Modulated Channels, Open Broadcaster and LTE Services

The use of frequencies allocated for future O.B. Digital and Long Term Evolution (LTE) wireless services should not be used for the distribution of FOXTEL services.

FOXTEL modulated services should be kept below 694MHz thereby ensuring that frequencies chosen do not suffer interference from local O.B. or other services.

Frequency Division Duplex LTE mobile broadband technologies are expected to run above 694MHz.

Important Note:

It is highly recommended that VSB modulators using the UHF hyperband frequencies between 302–466.5MHz and/or Band IV (non-broadcast) frequencies from 470–522.5MHz be used for commercial integrations to minimise the chance of ingress from unwanted carriers. However, where output frequencies are not interfered with by an Open Broadcast analogue or digital carrier, and where FOXTEL will be the only in-room entertainment TV system, DSB modulation may be quoted and used upon customer understanding of the limitations.

7.2.3.4.8. FOXTEL Integration in Bar Areas

When FOXTEL is integrated into an MATV system that feeds FOXSPORTS 1 and 2, plus other channels into a Bar area and Hotel it is a condition of FOXTEL that FOXSPORTS 1 and 2 are not visible in the Bar area. To ensure these channels are not visible the installation of 2 filters in-line should be installed in the drop cable that feeds the Bar area. Figure 18 shows a typical installation.

7.2.3.4.9. Outlet Levels

To ensure that the filters work correctly the signal level at the bar area outlets must not exceed 70dBuV. If the signal is greater than 70dBuV an in line attenuator can be fitted before the filters to reduce signal power. (Refer to Figure 18.)

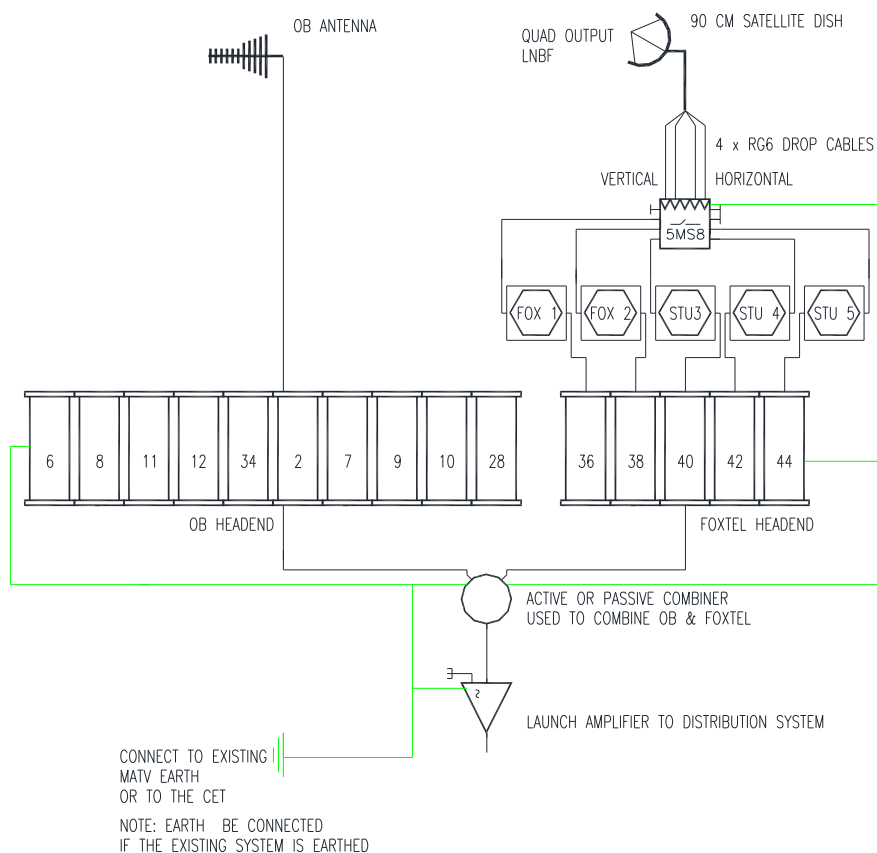


Figure 17 – MS12-11 (Example shown for Sydney)

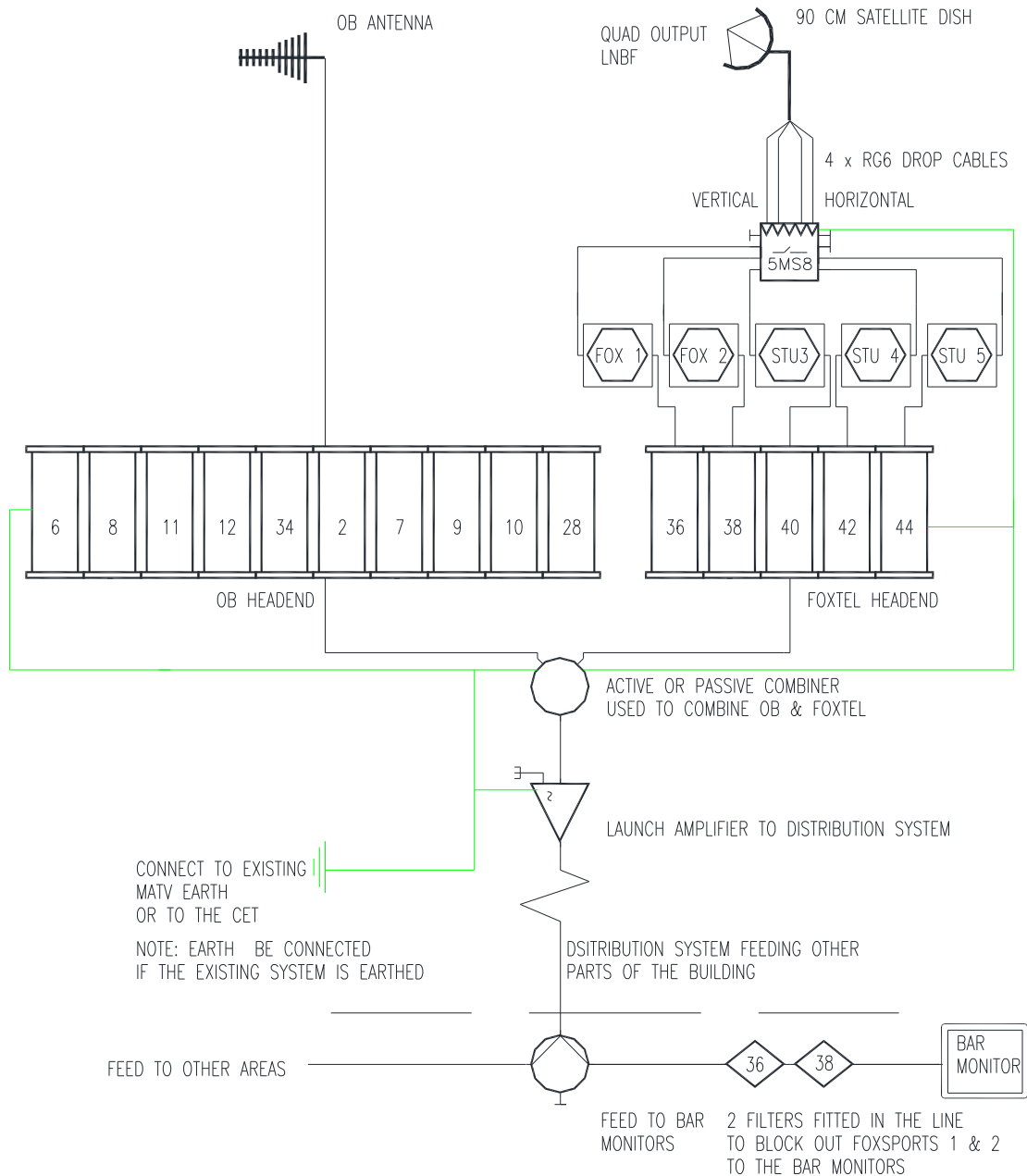


Figure 18 – MS12–1 Bar Installation Example Using Filters (Example shown for Sydney)

7.2.3.4.10. Hotel RF Integration VSB Modulators

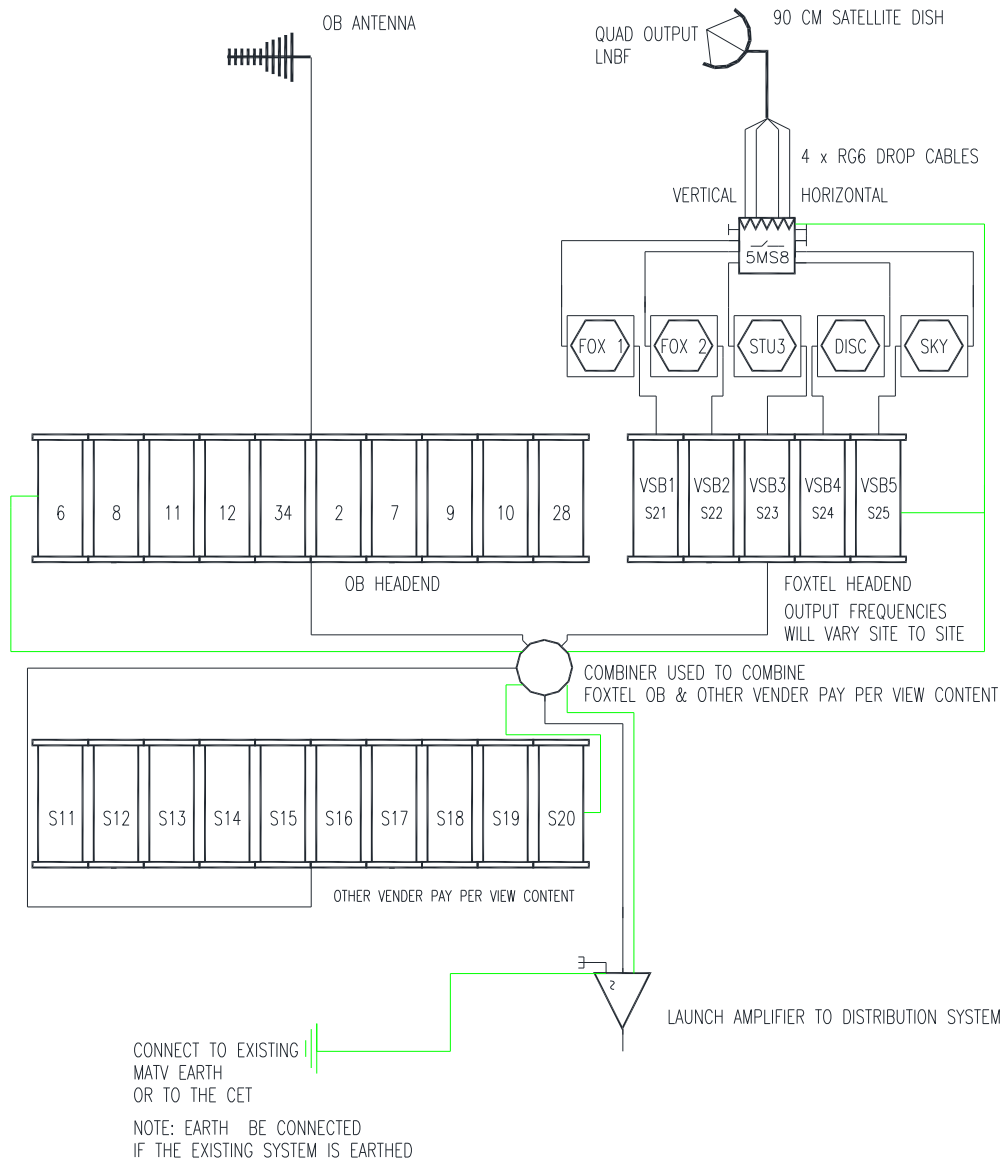


Figure 19 – MS11–1 (Example shown for Sydney)

7.2.3.4.11. Post Installation

At the completion of the Commercial installation, an approved 'as built' SOW document shall be forwarded to FOXTEL to enable the building to be activated for the FOXTEL service.

Note: The National Service Provider / installation company submits an electronic copy of the 'as built' Scope of Work document to FOXTEL.

Installation 'As Built' Drawing

An accurately electronic 'as built' design showing all the equipment that has been installed in the system must be provided with the 'as built' SOW document.

Installation Photographs

Photographs shall be provided as appropriate for:

- Dish location – showing skyline and Dish; LNB; Mount – close up photo
- Headend site
- Multiswitch location and earthing
- OB and FOXTEL integration point.

Installation Certification Testing

Post installation testing involves completion of a commissioning sheet contained within the 'as built' SOW document.

All tests must comply with the wallplate specifications for installations tables and be documented on the As Built SOW.

Testing by data logging is also acceptable.

LNB Tests

All ports on the LNB must be tested for Digital Channel Power, Modulation Error Ratio and Bit Error Rate for the following Transponders (as a minimum).

C1	D3
T14, T20	T10, T12, T14, T19, T24

Amplifier Tests

The input and output signal levels are to be tested at the existing MATV launch amplifier. Channel loading should be taken into account and launch level adjusted accordingly.

Multiswitch Tests

The multiswitch must be tested for Digital Channel Power, Modulation Error Ratio and Bit Error Rate for Transponders as per **LNB Tests shown above** (as a minimum). Testing by data logging is also acceptable.

Wallplate Tests

The signal levels must be tested at wallplates:

- Closest to the Headend

- Central to the Headend and
- Furthest from the Headend.

All tests must comply with the wallplate specifications for installations tables.

Testing by data logging is also acceptable.

Quality Control

FOXTEL's quality expectations and processes focus on ensuring that the design and field installation process is positive and beneficial to everyone involved in the FOXTEL process and that they will happily recommend the FOXTEL process to others.

FOXTEL reserve the right to actively inspect the work performed by the National Service Provider to ensure that their work meets the required standards. If subsequently the work is found to be of an inferior standard then the National Service Provider will be required to make the necessary reparations.

7.2.4. Multi-Residential Estate Designs

7.2.4.1. Distributing FOXTEL and O.B services via Optic Fibre to 5 wire Multiswitches within each Block of Units

The objective with this type of installation is to use optical transmitters and receivers to feed FOXTEL Horizontal – Vertical, OB services and two other polarities throughout the estate from another orbital slot. Five wire multiswitches are then installed in each block of units feeding two twin wall plates within each unit.

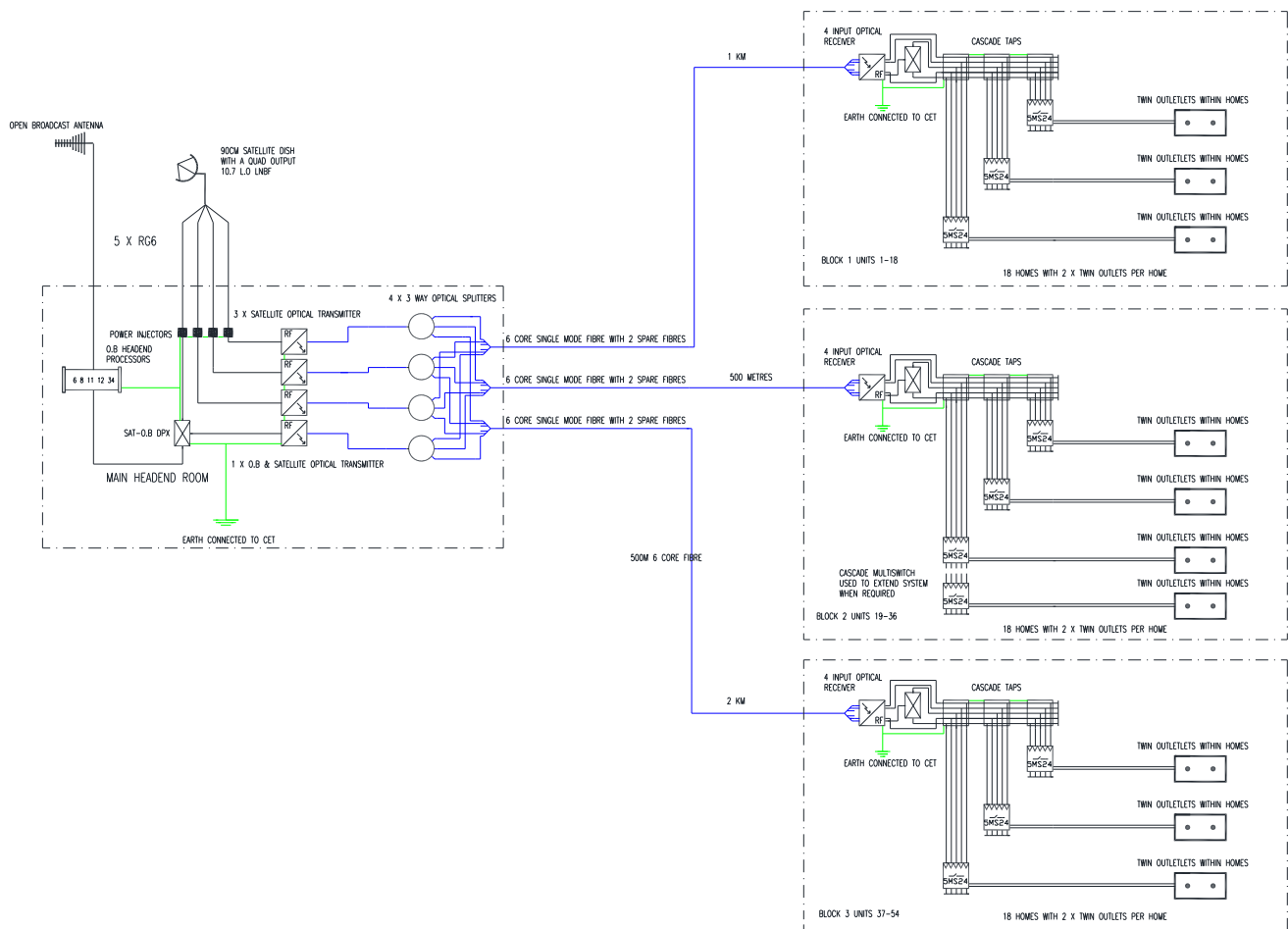


Figure 20 – MS14–2A

7.2.5. Earthing and Equipotential Bonding (CET) Designs



All system components must be earthed in compliance with AS/NZS 1367:2000, AS/NZS3000, (earthing conductors), and AS/ACIF S009:2006.

Equipotential bonding is used to ensure that no hazardous voltages are present on the outer conductors of a cable or any metallic component within the network.

A licensed electrician must carry out connections within the electrical switchboard.

Note: A suitably qualified person can carry out the connection for protective earthing external to the switchboard.

Refer to the following designs for specific diagrams for earthing outline the preferred methods for connection of a CET and bonding conductor.

7.2.5.1. Equipotential Bonding Commercial Installation (Single Dwelling Residence – more than one Wallplate)

Figure 21 shows the method for Equipotential Bonding in a commercial (Single Dwelling Residence) single premise installation with more than one outlet.

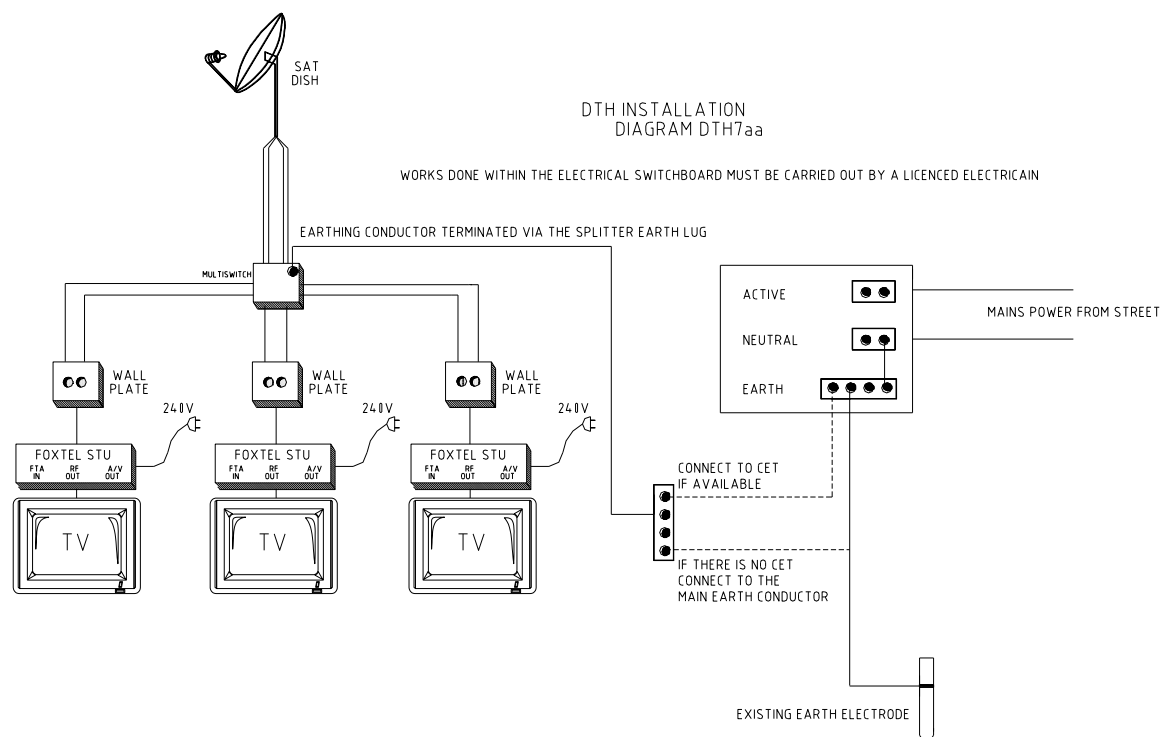


Figure 21 – Equipotential Bonding in Single Premises

7.2.5.2. Equipotential Bonding Multi-Dwelling Unit or Commercial Installation

Figure 22 shows the method for Equipotential Bonding in a Multi-Dwelling Unit or commercial multiple premise installation.

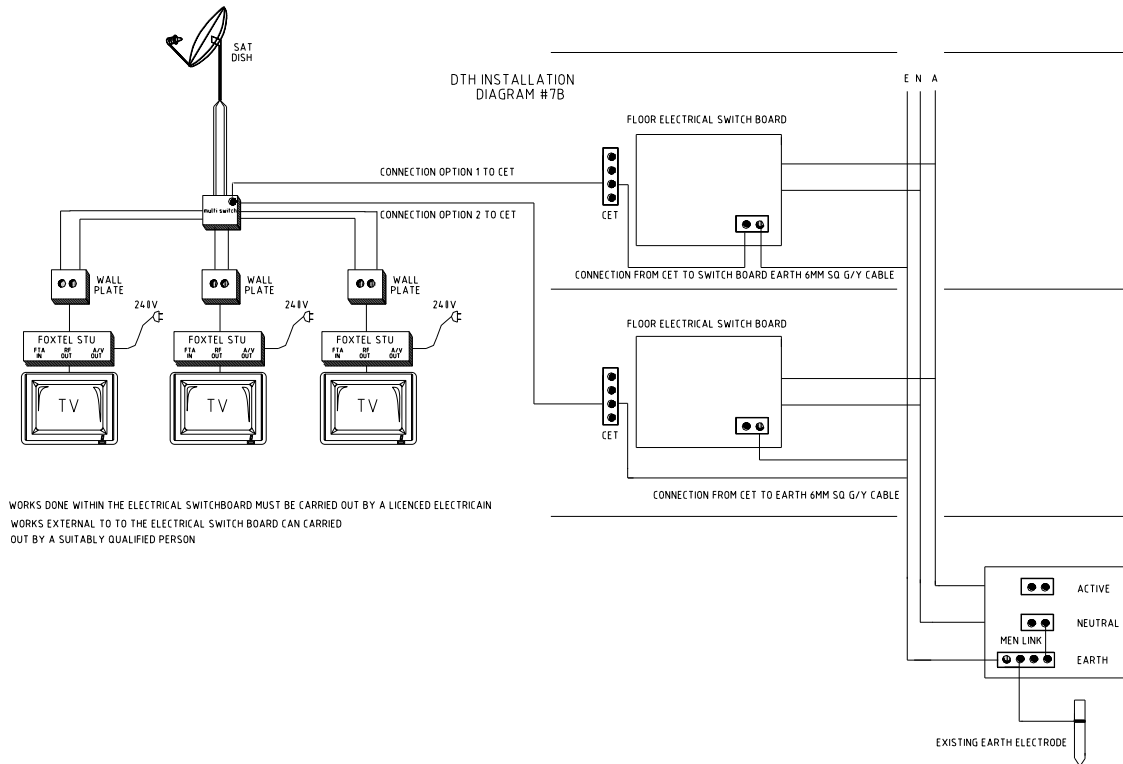


Figure 22 – Equipotential Bonding Multi-Dwelling Unit and Commercial Premises

Earthing of the system is achieved via the methods shown in **Figure 23** and **Figure 24**:

Passive Method

1. Connect all incoming cables to passive 4 barrel grounding block
2. Connect all outgoing cables to passive 4 barrel grounding block
3. Connect multiswitch to passive 4 barrel grounding block using a 2.5mm² yellow green earth wire
4. Connect earthing conductor using a 6mm² yellow green earth wire to the passive 4 barrel grounding block
5. Run the 6mm² earth down the riser to the building CET or building earth.



Figure 23 – Earthing Example – Passive Method

Note: If requested by FOXTEL or by a Regulatory body, the Installation Company must be able to provide certification that the earthing carried out by a licensed electrician meets the required standards.

Active Method

1. Connect multiswitch to the CET using a 2.5mm² yellow green earth wire
2. Connect the CET and the Earthing Conductor using a 6mm² yellow green earth wire.
3. Run the 6mm² earth down the riser to the building CET or building earth.

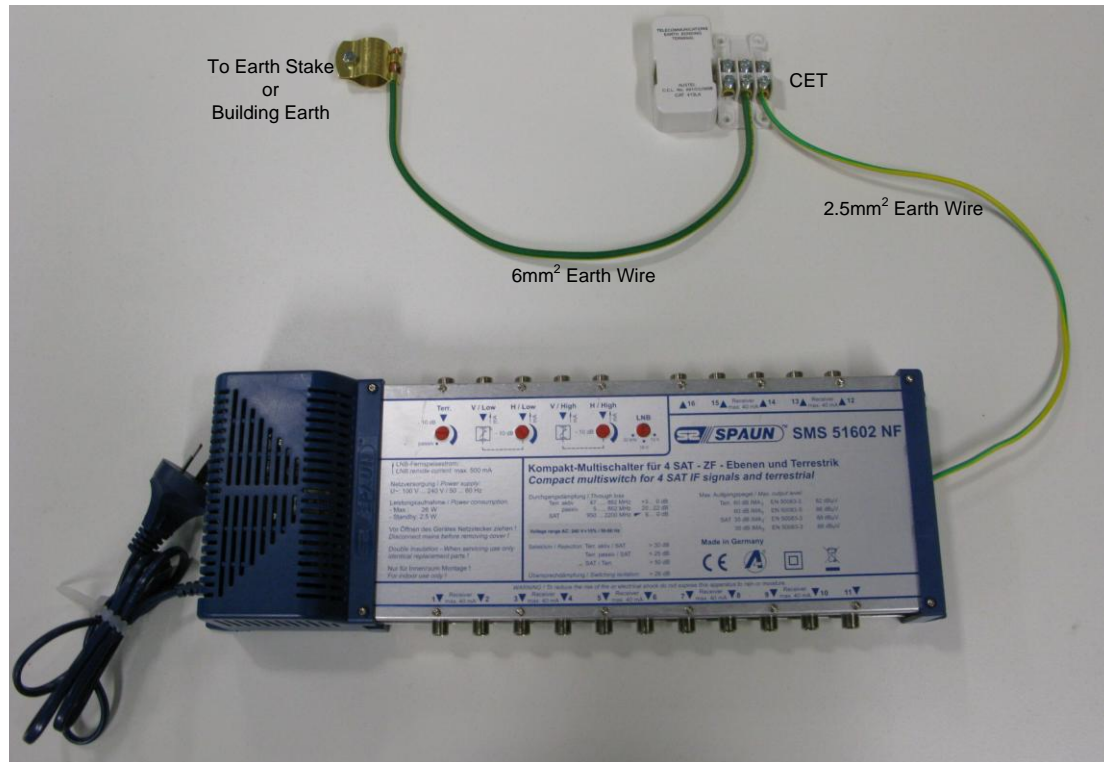


Figure 24 – Earthing Example – Active Method

8. Technical Reference Information

This section contains general information for installation companies and any other parties needing to broaden their understanding of the technical aspects of FOXTEL installations.

Note: For FOXTEL satellite installation requirements and processes, see Section 6.

8.1. Quick Reference

The following sub-sections provide a useful overview of the most commonly requested information:

- Packages and main features of FOXTEL Section 8.1.1
- Dish alignment procedure Section 8.1.2
- Test equipment Section 8.1.5

8.1.1. Main Features of FOXTEL

Refer to the latest distribution pack of FOXTEL literature.

8.1.2. Aligning a Satellite Dish

The Scope of Work will be used to select the appropriate mount and dish and the selection will be confirmed as appropriate for the installation location by a FOXTEL Industry Designer. The preferred method for alignment is to use a Multi-Dwelling Unit meter or dish-pointing meter (see Installer Product List). When using these meters there are four steps to aligning a dish:

1. Ascertain the city azimuth elevation using Table 9.
2. Use a compass for the azimuth setting and an inclinometer for the correct elevation for the location (ensure the mount is vertically plumb).
3. Adjust the dish precisely by panning horizontally (azimuth) and vertically (elevation) to receive maximum signal strength.
4. Align the LNB to obtain maximum cross-polarisation adjustment (maximum Modulation Error Ratio level).

Table 9 – Azimuth, Elevation and Skew Information

Metro Areas			
Location	Azimuth Magnetic North (degrees)	Elevation of Satellite (degrees)	Skew (degrees)
Adelaide	21.54	45.39	22
Brisbane	-4.74	57.81	39
Canberra	-0.1	48.41	35
Melbourne	6.74	44.65	31
Perth	60.83	33.17	-1
Sydney	-3.63	50.26	38

Table 10 – Azimuth, Elevation and Skew Information cont;

Regional Areas			
Location	Azimuth Magnetic North (degrees)	Elevation of Satellite (degrees)	Skew (degrees)
Albany	53.82	32.81	3.62
Albury	15.23	47.06	32.74
Alice Springs	40.55	52.78	4.34
Broome	65.27	46.25	-14.78
Bundaberg	-1.78	60.65	37.21
Cairns	24.77	66.91	14.71
Carnarvon	66.47	34.98	-10.45
Ceduna	32.59	45.49	13.81
Coffs Harbour	-6.22	54.54	40.08
Coober Pedy	33.35	48.9	11.82
Darwin	61.91	57.43	-17.56
Dubbo	2.82	51.63	33.46
Geraldton	63.62	33.9	-5.3
Gosford	-4	50.8	38
Griffith	6.95	48.76	30.75
Hobart	-0.99	39.75	35.76
Horsham	13.05	44.99	27.25
Kalgoorlie	53.23	38.25	1.35
Launceston	0.26	41.27	35.09
Moree	1.78	54.99	34.23
Mount Isa	34.28	59.45	7.77
Newcastle	-4.7	51.4	38
Port Augusta	24.8	47.37	18.79
Port Pirie	23.76	46.8	19.71
Rockhampton	4.14	61.95	32.49
Roxby Downs	28.04	48.73	15.98
Tamworth	-1.61	53.37	36.64
Townsville	26.16	65.09	20.4
Whyalla	31.55	46.72	18.97

If you require Azimuth Elevation and Skew details for locations other than those shown in the tables contact your satellite dish supplier or manufacturer. Further Azimuth Elevation & Skew details can be found on the following link.

<http://www.jonsa.com.au/Angles2/index.php>

8.1.3. OPTUS C1 Transponder Listings

The following Table provides transponder information for the C1 satellite.

Table 11 – Optus C1 Transponder Frequencies

Down Link Transponder	Down Link Polarity	Downlink Centre Frequency MHz	Symbol Rate	FEC	10.7 L.O Centre Frequency MHz
1	Vertical	12287.0	27800	$\frac{3}{4}$	1587.0
2	Vertical	12367.0	27800	$\frac{3}{4}$	1667.0
3	Vertical	12407.0	30000	$\frac{3}{4}$	1707.0
4	Vertical	12447.0	27800	$\frac{3}{4}$	1747.0
5	Vertical	12487.0	27800	$\frac{3}{4}$	1787.0
6	Vertical	12527.0	30000	$\frac{3}{4}$	1827.0
7	Vertical	12567.0	27800	$\frac{3}{4}$	1867.0
8	Vertical	12607.0	27800	$\frac{3}{4}$	1907.0
9	Vertical	12647.0	27800	$\frac{3}{4}$	1947.0
10A	Vertical	12692.5	28650	$\frac{1}{2}$	1992.5
10B	Vertical	12728.25	28650	$\frac{1}{2}$	2028.25
11	Horizontal	12278.0	27800	$\frac{3}{4}$	1578
12	Horizontal	12358.0	27800	$\frac{3}{4}$	1658.0
13	Horizontal	12398.0	27800	$\frac{3}{4}$	1698.0
14	Horizontal	12438.0	27800	$\frac{3}{4}$	1738.0
15	Horizontal	12478.0	27800	$\frac{3}{4}$	1778.0
16	Horizontal	12518.0	27800	$\frac{3}{4}$	1818.0
17	Horizontal	12558.0	27800	$\frac{3}{4}$	1858.0
18	Horizontal	12598.0	27800	$\frac{3}{4}$	1898.0
19	Horizontal	12638.0	27800	$\frac{3}{4}$	1938.0
20	Horizontal	12688.8	27800	$\frac{3}{4}$	1988.8

provides transponder information for the D3 satellite.

Table 12 – Optus D3 Transponder Frequencies

Down Link Transponder	Down Link Polarity	Downlink Centre Frequency MHz	Symbol Rate	FEC	10.7 L.O Centre Frequency MHz
1	Vertical	11720.5	27800	$\frac{3}{4}$	1020.5
2	Vertical	11762.0	27800	$\frac{3}{4}$	1062.0
3	Vertical	11803.5	27800	$\frac{3}{4}$	1103.5
4	Vertical	11845.0	27800	$\frac{3}{4}$	1145.0
5	Vertical	11886.5	27800	$\frac{3}{4}$	1186.5
6	Vertical	11928.0	27800	$\frac{3}{4}$	1228.0
7	Vertical	11969.5	27800	$\frac{3}{4}$	1269.5
8	Vertical	12011.0	27800	$\frac{3}{4}$	1311.0
9	Vertical	12052.5	27800	$\frac{3}{4}$	1352.5
10	Vertical	12094.0	27800	$\frac{3}{4}$	1394.0
11	Vertical	12135.5	27800	$\frac{3}{4}$	1435.5
12	Vertical	12177.0	27800	$\frac{3}{4}$	1477.0
13	Horizontal	11720.5	29455	$\frac{3}{5}$	1020.5
14	Horizontal	11762.0	27800	$\frac{3}{4}$	1062.0
15	Horizontal	11803.5	27800	$\frac{3}{4}$	1103.5
16	Horizontal	11845.0	27800	$\frac{3}{4}$	1145.0
17	Horizontal	11886.5	27800	$\frac{3}{4}$	1186.5
18	Horizontal	11928.0	27800	$\frac{3}{4}$	1228.0
19	Horizontal	11969.5	27800	$\frac{3}{4}$	1269.5
20	Horizontal	12011.0	29455	$\frac{3}{5}$	1311.0
21	Horizontal	12052.5	29455	$\frac{3}{5}$	1352.5
22	Horizontal	12094.0	29455	$\frac{3}{5}$	1394.0
23	Horizontal	12135.5	27800	$\frac{3}{4}$	1435.5
24	Horizontal	12177.0	27800	$\frac{3}{4}$	1477.0

8.1.4. Identification of Cables

Service identification labels (Panduit – PLDR-1) or equivalent are required for each lateral and or home run cable to identify a particular subscriber's cable at the cascable tap and/or multiswitch. This label is to show the house or unit number and final destination location, for example, U24 lounge.

Figure 25 shows a multiswitch with Service Identification Labels attached to the cables.



Figure 25 – Service Identification Labels

8.1.5. Test Equipment

Test equipment to be used on FOXTEL installations have been categorised into the following work requirement types

- a. Dish pointing for Single Dwelling Residence installs
- b. Installation, service calls – troubleshooting and commissioning work for Small MDUs, MDUs, MREs and commercial (satellite only)
- c. Quality Audit Inspections (QAI), installation, service calls – troubleshooting and commissioning work for integrated RF or OB and satellite MDUs, MREs and commercial work

Figure 26 shows a meter used for MDU and MRE installations.


HD Flash Commercial Large Screen Meter

Master STC

HD Compact
Figure 26 –MDU Approved Meters

Table 13 shows the equipment for each work type.

Table 13 – Work Specific Test Equipment

Test Equipment Use Description	Work Type	Dish pointing audio	DCP	MER	BER		Data logging
					pre V	Pre RS	
Rover HD Flash Commercial	A, B, C	✓	✓	✓	✓	✓	✓
Rover Master STC	A, B, C	✓	✓	✓	✓	✓	✓
Rover HD Compact	A, B, C	✓	✓	✓	✓	✓	✓

Note: A = Dish pointer device
B = MDU Installation / Service Call Out / Troubleshooting meter
C = MDU / MRE / Commercial meter

Important Note: All MDU – Commercial Technicians shall use a DVBS-2 capable meter. Refer to the Foxtel Installer Product List for further information.

9. Troubleshooting

This section provides an overview of the fault-finding process, which will help identify faults that have arisen during the installation, for example, wallplate performance does not comply with FOXTEL specifications. A Multi-Dwelling Unit digital test meter is an essential tool for successful fault analysis and identification. Details on these meters are provided in the Installer Product List

Satellite installation faults can be diagnosed by using the installation design as a signal flow map. By tracing the signal path from the wallplate to the LNB and testing each component along the path, it will become clear which section (fault zone) contains the fault.

There are three steps in the fault-finding process:

1. Analysis of the fault (where to use test equipment and what to measure)
 - symptoms of the fault
 - description of why it occurs
2. Identification of the cause
 - a list of possible causes
3. Fault rectification (using test equipment to confirm fault is fixed)
 - a list of possible solutions

Table 14 can be used to enter Fault Analysis and Identification details.

Table 14 – Fault Analysis and Identification

Analyse		Identify	Rectify
Problem / Symptom	Why it occurs?	Possible Cause	Solution
Low Digital Channel Power at wallplate			

Appendix A. Glossary

Table 15 – Glossary

Term / Acronym	Meaning
AC	Alternating current
Active Components	Equipment used in SMATV systems, which require power to operate.
Adjacent TV Channels	Any two channels with video carriers separated by a statutory guard band.
Amplifier	An active device used to boost RF signal levels.
Amplifier Antenna (Mast Head)	(Antenna amplifier) An amplifier directly associated with an antenna should be low noise to improve system signal to noise ratio.
Amplifier Cascaded (Cascaded amplifier)	An amplifier, which amplifies a signal already, amplified by another amplifier, must be de-rated by 3dB for each doubling of the cascade
Amplifier Distribution (Distribution amplifier)	An amplifier, located at the head-end of the system, designed to compensate for the system losses and to provide the necessary levels at the system outlets.
Amplifier Repeater (Repeater amplifier)	An amplifier designed to compensate for the system losses and to provide the necessary levels at the system outlets. Note: must be de-rated by 3dB for each doubling of the cascade
Amplifier Single Channel (Single channel amplifier)	A distribution amplifier designed to amplify a single channel only and to provide rejection of other channels.
Amplifier Wide (Wide band amplifier)	A distribution amplifier or a repeater amplifier designed to amplify a multiplicity of channels (for example, VHF-UHF and SAT). Limited bandwidth Amplifiers are intended to amplify no more than 10TV channels.
Attenuator	A passive device used to reduce the level of a RF signal.
Automatic Gain Control Amplifier	An amplifier designed to compensate for fluctuations of the input signal and to provide a constant output signal.
Backbone Cabling	All cable plant from the headend to any subdistribution node points. Typically the backbone cable is RG11Q in large systems.
Bandwidth	A specific range of frequencies.
Bit Error Rate (BER) post Viterbi	Used in digital transmission system to indicate the quality of the transmission (defined by number of error bits/total bits after Viterbi error correction)
Bit Error Rate (BER) pre Viterbi	Used in digital transmission system to indicate the quality of the transmission (defined by number of error bits/total bits before Viterbi error correction)
Block Converter	A device uniformly changing frequencies of all signals in a particular block of channels.
Braid	Strands of wire woven together to form an electrical shield.
By-pass Mode	When activated on a VCR the input channels are shunted straight to its output.

Term / Acronym	Meaning
Carrier to Noise	The difference expressed in dB between the vision and noise floor level, at a given point in the system. The C/N is the difference between a wanted signal and unwanted noise.
Carrier to Inter-modulation Ratio	The difference expressed in dB, at a specified point of the system between the levels of the carrier and of the inter-modulation product.
Cascadable Tap	A passive device with multiple 5 inputs, 5 line outputs and 5 resistive tapped outputs with slope or tilt.
Cascadable Tap System	A complex cabling system method or topology. Also known as Tree and branch or drop tap system in MATV/CATV systems. Uses Taps (cascaded) to supply signal to the multiple wallplates
Channel Combiner	A device used to combine ports carrying VHF and/or UHF channels into a single port. (NOTE: Most devices can be used in reverse to split the channels, eg. diplexer)
Channel Converter	A device changing frequency of all signals in a particular channel by the same amount.
Channel Loading	Number of TV channels in operation. Maximum Channel Loading refers to the maximum number of channels for which the system is designed. The output level performance of wide band amplifiers depends on channel loading. Amplifiers require de-rating depending on the number of channels being amplified. The manufacturer will provide the de-rating factors on their data sheet.
Chrominance	A characteristic of a composite TV signals describing the colour. Requires luminance to be visible.
Chrominance/ Luminance delay Inequality	Delay between associated chrominance and luminance signals within a single channel (4.43 MHz) measured in nanoseconds. The performance and worst case channel must be quoted.
Composite Second Order (CSO)	Amplitude distortion due to second order composite non-linearities of the system. The worst case (for any channel) must be specified.
Composite Triple Beat (CTB)	Amplitude distortion due to the third order composite non-linearity of the system. The worst case (for any channel) must be specified.
Composite Cross Modulation (CCM)	Refers to cross-modulation at maximum channel loading.
Commissioning	Tests which confirm that an installation is operating to designed specifications.
Conifer	A brand name for MPS antennas and downconverters.
Cross-modulation	Interfering (unwanted) modulation of carrier by modulation of another carrier or carriers due to non-linearities of the equipment.
Customer Tap (-off)	A device designed to obtain signal from a trunk cable node and incorporating means for connection to the subscriber's feeder. Customer lateral feeder is also referred to as customer drop cable. The tap should be the last device between outlet plates and the through port terminated with a 75 Ohm load.
Customer wallplate	A device fitted in the user's premises for connection of the receiving equipment. It is also referred to as a system outlet or TV outlet.
dBi – Decibel	Antenna gains in decibels compared to an Isotropic antenna. The logarithm of a ratio of two powers multiplied by 10.

Term / Acronym	Meaning
dBuV –Decibel Microvolt	Microvolts expressed as a decibel ratio. The logarithm of the value of a signal measured in uV multiplied by 20 (to convert dBuV to dBmV deduct 60 from the value expressed in dBuV).
dBmV – Decibel Millivolt	Millivolts expressed as a decibel ratio. The logarithm of the value of a signal measured in mV multiplied by 20 (to convert dBmV to dBuV add 60 from the value expressed in dBmV).
DC	Direct Current.
Decibel Ratio	The logarithmic ratio of two powers multiplied by 10 log or two voltages multiplied by 20 log.
Dielectric	Insulative material used to separate two electrical conductors.
Directional Coupler	A coupler sensitive to the direction of the flow of the energy and intended to minimise the effect of unwanted reflected signals.
Directivity	The ability of a device to discern the direction of the flow of electro-magnetic energy.
Display Channels	Programmable memory location in a receiver, which stores the actual TV frequency.
Distribution Amp.	An active device used after a launch amplifier to compensate for system losses.
Down converter	A device used to translate a high frequency to a lower frequency.
Diplexer	A device in which the signal energy at one (input) port, which covers a frequency band, is divided between two or more (output) ports, each of which covers a part of that frequency band. Note: this device can be used in reverse direction for combining the two signals of different frequency.
F connector	Type of connector used in open broadcast and subscription television systems.
F type barrel	Used to facilitate connection between two F type connector also known as F-81.
Feeder-Node	A feeder node is a point in the SMATV that may consist of amplifiers, splitters and couplers that the lateral cable feeding the subscriber's unit is connected to.
Filter	A device designed to pass or block a single (pre-determined) frequency or a range (band) of frequencies with a minimum of loss, and the same time, to attenuate all other frequencies.
Filter (band-pass)	A device designed to pass a range (band) of frequencies.
Filter (band-stop)	A device designed to stop (eliminate) a range (band) of frequencies.
Filter (high-pass)	A device designed to pass high frequencies.
Filter (low-pass)	A device designed to pass low frequencies.
Gain	The ratio of the output power to the input power expressed in dB.
GPO	General Purpose Outlet (240Volt power point).
Ghosting	When multiple images appear on the TV picture due to multi-path or ingress of unwanted reflected signal into the system due to poor screening may also cause leading edge ghosting.
HAM	A colloquial term used to describe an Amateur Radio Operator.
Head-end	Location from which all signals are launched in a distribution system.
Home run (Star wired)	A simple cabling system method or topology. Where all cable(s) are run

Term / Acronym	Meaning
	from the wallplate(s) to a central location where a end of line device, for example, multiswitch is usually installed
HRCT	A more complex cabling system method or topology. A hybrid of Home Run and Cascaded Tap systems together, known as HRCT hybrid wiring method
Impedance	A complex resistance of inductive, capacitive reactance and DC resistance.
Ingress	Any amount of unwanted RF signals entering a device or cable system.
Inter-modulation	The process in which the non-linearity of the equipment produces spurious signals (Inter-modulation products) at frequencies being linear combinations of those of the input signals. In other words, when two or more signals beat together to produce new signals.
Insertion Loss	The attenuation of the signal strength due to the insertion of passive devices in a distribution system.
Isolation	The attenuation between two ports usually expressed in dB. AC isolation refers to isolation of the device from AC, for example,, of isolation in a system outlet of both inner and outer conductors of the coaxial cable from the outlet.
Impedance Matching	A process by which two impedances are made relatively equal (a well-matched test set up has at least 20dB return-loss-ratio relative to the system impedance).
LBand	Frequencies located in the band 950-2150 MHz (Satellite IF Band)
Low Noise Block Feed or LNB	Low Noise Block Feed – a down-converter which sits in the front or centre of the dish, and collects all the reflected microwaves from the dish. The LNB has an integrated feed horn. The waves travel along the feed horn and enter the LNB where they are converted and transferred to the satellite receiver via the coax cable.
LNC	Low Noise Converter (converts high frequencies to lower frequencies).
Lateral Cable	A cable, which connects, from the termination point or sub-distribution point to the wallplate
Lead in cable (subscriber feed)	Feeder cable connecting premise from cascable tap to sub-distribution point (node with all premise lateral cables)
Launch Amplifier (twin)	An active device located at the Head-end which boosts RF signal levels.
Local Origination	The production of local programs or services through a channel or channels in a distribution system not involving broadcast signals.
Luminance	A characteristic of a composite television signal (represented by Ey) describing light intensity. Measured in lux.
MATV	Master Antenna Television. Where multiple rooms or units in the one building (for example a hotel) receive TV and radio channels through a common, master antenna.
Modulation Error Ratio (MER)	Modulation Error Ratio (in band noise ratio)
Modulator	A modulator converts the video (and/or audio) output of the STU to an RF signal so that it can be received on a standard TV.
MHz	Mega Hertz (One Million Hertz)
Multi-path	Occurs when an analogue terrestrial TV signal suffers refraction or is reflected by external objects.

Term / Acronym	Meaning
Noise	Unwanted electromagnetic radiation.
Noise Figure	Noise factor expressed in dB.
OB TV	Open Broadcast Television also known as FTA or OFF AIR. This term includes analogue and digital.
PAL	Phase Alternation by Line (phase error correction method for colour TV signals) in Australia.
Passive Components	A circuit, equipment or network used in Pay-TV systems which do not require power to operate.
Personal Digital Recorder	Personal Digital Recorder (PDR) – receives digital information via cable or satellite, decodes this information and sends it to the TV. Also has ability to record and play back TV programmes
Polarisation	Describes the direction of the electric field in an electromagnetic wave.
Radiation system (System radiation)	The unwanted transmission of signals from any part of the system (cables, amplifiers and passive devices) to air.
Radiation spurious (Spurious radiation)	Any radiated signal transmitted outside the allocated channels (this may interfere with other services).
Radio Interference	Unwanted RF signals which can degrade the reception of TV services.
Reflection	The reflection of electromagnetic energy due to a poor impedance matching.
Reflection Coefficient	A measure of the reflected signal, defined as a ratio of the reflected wave to the forward wave.
Return Loss (RL)	Defined as the logarithm of the reciprocal value of the reflection coefficient, multiplied by 20 and expressed in dB. In other words, a measurement of impedance mismatches.
RF	Radio Frequency
SMS	Subscriber Management System
Set Top Unit/Box	An addressable receiver used to receive and decode the FOXTEL services. Also referred to as an IRD (Integrated Receiving Device)
Signal to Noise Ratio (SNR)	Ratio of the signal level to the noise level measured at the same point in the system and expressed in dB.
Single Channel Amplifier	An active device that is tuned to amplify only one TV channel.
Slope (also Tilt)	Plot of frequency versus signal amplitude over a specified bandwidth. This is also known as the tilt of the system.
SMATV	Satellite Master Antenna TeleVision. Where multiple rooms or units in the one building (for example a hotel) receive TV and radio channels through a common, master satellite receiver.
Splitter	A device designed to separate a specified amount of RF signal into equal parts from the main transmission.
Scope of Work	Scope of Work detailed information required to produce RF design and quotation for installation of system
Spurious	Unwanted signals generated from an active device, for example,, an amplifier.
Structural Return Loss	The return loss characteristic of a cable due to periodic structural

Term / Acronym	Meaning
	variations of the cable during manufacturing.
Sub-distribution Node Point	A junction where a number of cables carrying the RF signals converge. A point in a distribution system where backbone cabling splits into drop cables. All Node points must be earthed.
Subscriber Termination Point	The connection point for a drop cable just prior to entering a subscriber dwelling. This point is also known as the point of entry
Subscription TV	TV channels which the subscriber pays a fee to receive.
System Immunity	The ability of the system to operate without visible impairments in the presence of unwanted outside electro-magnetic fields. Standards Australia AS1367:2000 defines the "figure of merit" for <i>synchronous working</i> as the ratio of the working signal level or 'picked up' signal at the same outlet, with all system inputs terminated.
System outlet	see wallplate
Tap	A passive device with one input, one-line output and one or more resistive tapped outputs.
Transparent Digital Transmodulator	Transparent Digital Transmodulation converts a QPSK carrier (satellite) to QAM carrier (cable) so that they can be reticulated through a CATV or SMATV system.
Tee-Off	See directional coupler, Tap
Terminator (75 ohm)	A passive device fitted to an unused RF output or input port to inhibit reflections into the SMATV system.
Trunk Cable (twin)	Feeder cable to which branch feeder is connected. Note: This may not exist in smaller installations.
Trunk cabling	Main cable carrying RF signals through a building also known as a backbone cable.
Twin wallplate	Wallplate with two subscription television outlet plugs.
UV	Ultra Violet
VAC	Volt Amp Current.
VCR	Video Cassette Recorder
VSWR	Voltage Standing Wave Ratio –A ratio of adjacent maxima of a standing wave created by forward and reflected waves. It is related to the reflection coefficient by the expression: $VWSR= 1 + [r]$, where [r] is the absolute value of the reflection coefficient.

Appendix B. Drawing Symbols

A standard drawing symbol chart from AS/NZ:1367

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	PROCESSOR		3 INPUT 4W MULTISWITCH END OF LINE ACTIVE FTA & SAT		2 WAY CUSTOMER TAP		VARIABLE EQUALISER
	MODULATOR		3 INPUT 4W MULTISWITCH END OF LINE ACTIVE SAT PASSIVE FTA		4 WAY CUSTOMER TAP		IN LINE EQUALISER
	CHANNEL AMPLIFIER		3 INPUT 8W MULTISWITCH END OF LINE ACTIVE FTA & SAT		8 WAY CUSTOMER TAP		TERMINATOR
	OPTICAL TRANSMITTER		2 INPUT 8W MULTISWITCH END OF LINE ACTIVE SAT		2 WAY CUSTOMER TAP SELF TERMINATING		DC BLOCK
	OPTICAL RECEIVER		3 INPUT 4W M/S END OF LINE MAINS POWERED ACTIVE FTA & SAT		4 WAY CUSTOMER TAP SELF TERMINATING		POWER SUPPLY
	OPTICAL SPLICE		3 INPUT 8W M/S END OF LINE MAINS POWERED ACTIVE FTA & SAT		8 WAY CUSTOMER TAP SELF TERMINATING		POWER INSERTER
	OPTICAL SPLITTER		3 INPUT 4W MULTISWITCH CASCADABLE PASSIVE FTA & SAT		2 WAY SPLITTER		AMPLIFIER FORWARD PATH ONLY
	DIPLEXER		3 INPUT 6W MULTISWITCH CASCADABLE PASSIVE FTA & SAT		3 WAY SPLITTER 1 HIGH/2 EQUAL O/P's HIGH O/P DENOTED •		AMPLIFIER WITH REV PATH MODULE
	LOW PASS FILTER		2 INPUT 12W MULTISWITCH CASCADABLE ACTIVE SAT		3 WAY SPLITTER 3 EQUAL OUTPUTS		HEADEND
	HIGH PASS FILTER		2 INPUT 12W MULTISWITCH CASCADABLE ACTIVE SAT		4 WAY SPLITTER		CABLE SPLICE
	BAND PASS FILTER		5 INPUT 8W MULTISWITCH CASCADABLE PASSIVE FTA & SAT		DIRECTIONAL COUPLER		ELECTRICAL EARTH (CET)
	ATTENUATOR		5 INPUT 12W MULTISWITCH CASCADABLE ACTIVE FTA & SAT		3 INPUT / 3 OUTPUT MULTITAP		UHF ANTENNA
	OUTLET		5 INPUT 16W MULTISWITCH CASCADABLE ACTIVE FTA & SAT		5 INPUT / 5 OUTPUT MULTITAP		VHF / UHF ANTENNA
	INTEGRATED RECEIVER DECODER		5 INPUT 12W M/S END OF LINE MAINS POWERED ACTIVE FTA & SAT		5 INPUT / 5 OUTPUT TWO WAY SPLITTER		VHF ANTENNA
	5 INPUT 24W M/S END OF LINE LINE POWERED ACTIVE FTA & SAT		5 INPUT 16W M/S END OF LINE MAINS POWERED ACTIVE FTA & SAT		5 INPUT 5 OUTPUT LAUNCH AMPLIFIER MAINS POWERED		SATELLITE ANTENNA
	5 INPUT 24W M/S END OF LINE LINE POWERED ACTIVE FTA & SAT		5 INPUT 24W M/S END OF LINE LINE POWERED ACTIVE FTA & SAT		3 INPUT 3 OUTPUT LAUNCH AMP LINE POWERED		3 INPUT 3 OUTPUT LAUNCH AMP LINE POWERED

Figure 27 – Standard Drawing Design Symbols

Appendix C. Technical Specification

C.1. Passive Equipment

Equipment/Reading	Requirement
Terminal Fly-leads:	<ul style="list-style-type: none"> Terminal fly-leads are defined as those cables that connect a terminal device to a system outlet and/or those cables that connect a subscriber's terminal device to any device connected between the system outlet and the input to the terminal device. All connectors fitted to terminal fly-leads shall comply with IEC 60169-24. The return loss of the terminal fly-lead when terminated with a precision termination should be: <ul style="list-style-type: none"> $\geq 24\text{dB}$ in the range 5MHz to 862MHz $\geq 18\text{dB}$ in the range 950MHz to 2150MHz The terminal fly-lead shall be constructed from cable having the same structural return loss as that specified under coaxial cable in this section. The screening effectiveness of the fly-lead, measured according to IEC 60996-1 Amendment 1, should be $\geq 95\text{dB}$ in the range 30MHz to 1000MHz and $\geq 85\text{dB}$ in the range above 1000MHz to 2150MHz. To minimise the chances of damage, the dielectric of the fly-lead should be continuous along its entire length in the manner specified under coaxial cable in this section.
System Outlet:	<ul style="list-style-type: none"> The return loss of any TV interface port, located on the system outlet, should be $\geq 20\text{dB}$ in the range 40MHz to 2150MHz. The screening effectiveness of the system outlet, measured according to IEC 60996-1, should be $\geq 75\text{dB}$ in the range 30MHz to 1000MHz and $\geq 65\text{dB}$ in the range above 1000MHz to 2150MHz. Mains isolation is not permitted as it will disable the switching function, all systems should be earthed for Safety in accordance with AS1367.
Splitters:	<ul style="list-style-type: none"> The return loss for all ports located on splitters shall be $\geq 10\text{dB}$ in the range 40MHz to 862MHz and $\geq 10\text{dB}$ in the range 950MHz to 2150MHz. For all splitters, the peak-to-peak narrowband flatness from input to output and, input to any customer tap port, shall be $\pm 0.5\text{dB}$ for any 36MHz segment. The isolation between the output ports for a splitter shall be $\geq 18\text{dB}$ in the range 5MHz to 862MHz and $\geq 14\text{dB}$ in the range 950MHz to 2150MHz. In the case of splitters with unequal output division, the above requirements for isolation shall be increased by the difference in attenuation between the output ports. Linearity to be $\pm 0.5\text{dB}$ in the range 950MHz to 2150MHz.

Equipment/Reading	Requirement
Cascadable Taps:	<ul style="list-style-type: none"> The return loss for all ports located on taps shall be $\geq 10\text{dB}$ in the range 40MHz to 862MHz and $\geq 10\text{dB}$ in the range 950MHz to 2150MHz. For all cascadable taps, the peak-to-peak narrowband flatness from input to output and, input to any customer tap port, shall be $\pm 0.5\text{dB}$ for any 36MHz segment. The cascadable tap branch shall have positive slope between 950MHz and 2150MHz; the higher the tap value the lower the slope, for example, $1/10 = 3$ or 4dB slope, $1/20 = 1$ or 2dB slope. The RF mutual isolation between output ports for directional couplers and distribution taps shall be $\geq 27\text{dB}$ within the band 5 MHz to 862 MHz and $\geq 17\text{dB}$ within the band 950 MHz to 2150 MHz. These values shall be published. The screening effectiveness of any splitter or tap, measured according to IEC 60996-1 shall be $\geq 75\text{dB}$ in the range 30MHz to 1000MHz and $\geq 65\text{dB}$ in the range above 1000MHz to 2150MHz.
Coaxial Cable:	<ul style="list-style-type: none"> To minimise the chance of damage during installation and corrosion after installation, flexible cables, for example, RG6 and RG11, must have a continuous dielectric such that the centre solid conductor is in full contact with the dielectric and homogenous to the shield, along the entire length of the cable. Cables that comply with this standard include those constructed with solid, foam or cellularised-polymer dielectrics as long as they comply with all parts of this section where appropriate. Flexible cables constructed without this characteristic, such as air-spaced or semi-air spaced cables, or cables with a multi-strand centre conductor do not comply with this specification. The use of backbond hardline cables constructed with a sealed cell dielectric, or equivalent, that prevents moisture entry is permitted. All cables installed underground must be of the flooded type. The screening effectiveness of super trunk feeders, trunk feeders and branch feeders, measured according to IEC 60996-1 Amendment 1, should be $\geq 95\text{dB}$ in the range 30MHz to 1000MHz and $\geq 85\text{dB}$ in the range above 1000MHz to 2150MHz. The screening effectiveness of subscriber's drop feeders, measured according to IEC 60996-1 Amendment 1, should be $\geq 95\text{dB}$ in the range 30MHz to 1000MHz and $\geq 85\text{dB}$ in the range above 1000MHz to 2150MHz. The structural return loss for all cables, including terminal fly-leads, should be not less than 26dB. <p>Note: Cables that meet these specifications are typically RG6 and RG11 quad shield cables manufactured by Commscope, Trilogi, Belden and Timesfibre.</p>

Equipment/Reading	Requirement
Coaxial Connectors:	<ul style="list-style-type: none"> Only compression F-type connectors should be used at the interface between passive devices and flexible cables unless otherwise specified. The connectors specified above should comply with IEC 60169-24. The connectors used in conjunction with backbone hardline cables should be pin type in construction. The use of feed through connectors on these cables does not comply with this Specification. The return loss of the connectors specified above should be $\geq 20\text{dB}$ in the range 5MHz to 2150MHz, measured in accordance with IEC 60169-24. The screening effectiveness of the connectors specified above measured according to IEC 60996-1., should be $\geq 75\text{dB}$ in the range 30MHz to 1000MHz and $\geq 65\text{dB}$ in the range above 1000MHz to 2150MHz. It is a requirement of the Specification that in addition to the specifications mentioned above, all connectors used to terminate cables should meet those specifications published by the applicable cable manufacturer.
Other passive devices:	<ul style="list-style-type: none"> These devices include transfer points, power inserters/injectors, cable splices, galvanic isolators, terminating resistors, filters and equalisers. The return or loss on all ports of these devices should be $\geq 10\text{dB}$ in the range 40MHz to 862MHz and $\geq 10\text{dB}$ in the range 950MHz to 2150MHz. The peak-to-peak narrowband flatness from input to output passive, one and two port devices should be $\pm 0.2\text{dB}$ for any 0.5MHz and $\pm 0.5\text{dB}$ for any 7MHz segment. The screening effectiveness of these devices, measured according to IEC 60996-1, should be $\geq 75\text{dB}$ in the range 30MHz to 1000MHz and $\geq 65\text{dB}$ in the range above 1000MHz to 2150MHz.
Nominal Impedance:	The nominal impedance of all passive equipment should be 75 ohms. All measurements are to be referred to this impedance.

Table 16 – Passive Equipment Specifications

New FOXTEL items for satellite installations	Return Loss	Insertion thru loss	Linearity
RG6 "F" connectors	>20dB	<0.5dB	.+/- 0.25dB
RG11 "F" connectors (compression type)	>20dB	<0.5dB	.+/- 0.25dB
F-81 barrels	>20dB	<0.5dB	.+/- 0.25dB
Twin wall plates with F-81 barrels	>20dB	<0.5dB	.+/- 0.25dB
75 Ohm terminators	>20dB	N/A	N/A
3, 6 & 10dB Attenuators	>20dB	#	.+/- 0.5dB
Power injectors	>10dB	<1.5dB	.+/- 1.0dB
Splitters	>10dB	various	.+/- 0.5dB
Cascadable multi taps 5 inputs *	>10dB	<1.5dB	.+/- 0.5dB
Cascadable multi 2 way splitter, 5 inputs *	>10dB	<5.0dB	.+/- 0.5dB

Notes:

* Cascadable multi taps with 5 inputs (to replace existing directional couplers) and shall have 0 to +4dB pre tilt from 950-2150Mhz.

Insertion thru loss will be dependant on manufacturers equipment specifications.

C.2. Active Equipment

Equipment/Reading	Requirement
Active Distribution Equipment:	<ul style="list-style-type: none"> This specification is applicable to all coaxial limited bandwidth and broadband amplifiers used in cable distribution systems in the frequency range 5MHz to 2150MHz. Amplifiers that comply with the specifications may be exclusively forward path or reverse path amplifiers or possess both forward and reverse path capability. All amplifiers should incorporate F Type input and output ports.
Satellite Amplifier:	Separate Launch and line amplifiers or Launch and line amplifiers that are capable of combining OB services where applicable as well as separate vertical and horizontal services from the satellite. Where signals are to be distributed through out a system the amplifier should have four or five outputs to allow separation of OB, vertical and horizontal services. The number of outputs will depend on the type of equipment used. Where required the amplifier should have built in line powering option to provide voltage to the LNB and or next line amplifier/multiswitch where required. If the amplifier does not have line powering options power inserters should be allowed for with the correct voltage and current for the application on hand.
Frequency Range:	The frequency range or ranges, over which the equipment is specified shall be published.
Nominal Impedance:	The nominal impedance of all amplifier ports including test points should be 75 ohms. All measurements are to be referred to this impedance.
Return Loss:	<ul style="list-style-type: none"> The return loss specification of all input and output ports of an amplifier should be achieved under all specified conditions of automatic and manual gain and slope controls and with any combination of plug-in equalisers and attenuators fitted. The return loss of all ports of any broadband or limited bandwidth amplifier should be $\geq 10\text{dB}$ in the range 40MHz to 862MHz and $\geq 10\text{dB}$ in the range 950MHz to 2150MHz.
Gain and slope control:	<ul style="list-style-type: none"> The variable gain control may be either plug-in pad or potentiometer. Typically 0 – 20dB. The variable slope control may be either plug-in pad or potentiometer. Typically 0 – 12dB.
Flatness:	<ul style="list-style-type: none"> The flatness specifications should be achieved in all specified conditions of automatic gain control, manual gain control with any combination of plug-in equalisers and attenuators specified for use with the device. The flatness of the amplitude frequency response from the input to the output ports shall be published. Slope is assumed to be eliminated either by calculation or by cable. The peak-to-peak narrowband flatness from the input port to any output port should be $\pm 0.5\text{dB}$ for any 36MHz segment.
Broadband Amplifiers:	A broadband amplifier in this context is defined as one having a continuous bandwidth greater than 10 television channels.

Equipment/Reading	Requirement
Maximum Amplifier Output Level	The maximum output level figure assumes a channel bandwidth of 32MHz and a channel loading using a fully loaded noise spectrum 950MHz – 2150MHz (See C.2.1.1 – Digital Service Rating).
Screening Effectiveness of Equipment:	The screening effectiveness of all active distribution equipment including multiswitches measured according to IEC 728 should be $\geq 75\text{dB}$ in the range 30MHz to 100MHz and be $\geq 65\text{dB}$ in the range above 1000MHz to 2150MHz.
Power Supply:	The power supplies of all active distribution equipment should be capable of continuous operation and rated to meet local AC mains specifications and have a 'Certificate of Suitability' from the relevant Australian energy authority (except where the unit is a line powered device).
Multiswitches:	<ul style="list-style-type: none"> 5 wire multiswitch switches with 4 satellite and 1 terrestrial input are used with preference give to case cade multiswitches.

Table 17 – Cascade Multiswitch Active & Passive Terrestrial

Subscriber Connections	8 Ports	12 Ports	16 Ports	24 Ports
Input / Output Ports cascades	5/5	5/5	5/5	5/5
Subscriber Ports	8	12	16	24
Through Loss Terrestrial	5dB	6-5dB	6-5dB	6-5dB
Through loss Satellite	1-2.5dB	1.5-3.5dB	2-5dB	3-7.5dB
Tap loss Terrestrial Passive	21-22dB	22-23dB	26-27dB	27-28dB
Tap Loss Terrestrial Active	5-4dB	5-3dB	10-6dB	10-6dB
Tap Gain Satellite	0-6dB	0-6dB	0-6dB	0-6dB
Max output level Terrestrial 85-862 MHz 60dB IMA3 / EN60728-3	92dBuV	90dBuV	88dBuV	86dBuV
Max output Satellite 950-2200MHz 60dB IMA3 / EN60728-3	95dBuV	95dBuV	95dBuV	95dBuV
Switching Isolation	≥ 30dB	≥ 30dB	≥ 30dB	≥ 30dB
Isolation Trunk /Trunk	≥ 30dB	≥ 30dB	≥ 30dB	≥ 30dB
Isolation Receiver / Receiver	≥ 30dB	≥ 30dB	≥ 30dB	≥ 30dB
Max DC Through Path Trunks 0,2,3,&4	1A	1A	1A	1A
Current Consumption Each Receiver	Max 75mA	Max 75mA	Max 75mA	Max 75mA
Ambient Temperature	-20 to +50 degree C	-20 to +50 degree C	-20 to +50 degree C	-20 to +50 degree C

C.2.1. Amplifier Maximum Output Test Method

An alternative method for the measurement of the maximum level or more correctly channel power of a service in a group of services, may be specified a measurement that is based upon a specified level of IM's when the active device is provided with an input of wideband Gaussian noise. This is called Digital Service Rating.

C.2.1.1. *Digital Service Rating*

The level of IM's may be measured by the use of an amplitude notch in the noise spectrum that has depth greater than the IM's that are being measured. For the Terrestrial Band, a FM Band II trap is typically sufficient for this test. For the Satellite IF Band, a BNC "T" piece with a BNC male barrel on the stub of the T piece on the output of the noise generator, will typically provide a -35dB depth notch around 1.3GHz. The channel power is measured at a maximum (average of any ripple) in the spectrum at a specified bandwidth.

The recommended IM level rating for the Terrestrial Band is -30dB and for the Satellite IF Band -25dB IM is appropriate. -25dB IM is approximately equivalent to 1dB compression.

The recommended level measurement bandwidth is 7 MHz for DVB-T applications and 32 MHz for the Satellite IF Band. Other bandwidth can me be calculated from these base measurement bandwidths.

This wideband noise method for the rating of the level handling capacity of active devices will provide a very practical guide in systems that are intended to carry Digital services. The full bandwidth wideband noise will inherently provide a margin to allow the ability to handle a maximum number of channels in the useable spectrum.

The method allows the measurement to be conducted both in a testing laboratory and in the field with readily available and economical test equipment.

During system commissioning the method should be used to adjust the gains in the system with the noise input equal to the maximum transponder and / or DVB-T and / or DVB-C service. This method will substantially cater for increased loading of the Bands.

Appendix D. Reference Standards

Table 18 – Australian Standards

Number	Title	Published
AS/NZS 1367:2007	Coaxial cable systems for the distribution of analogue television and sound signals in single and multiple unit installations.	5-Jan-00
AS/NZS 3000:2000	Electrical installations (known as the Australian and New Zealand Wiring Rules)	15-Sep-99
AS/ACIF S008 - 2001	Requirements for authorised cabling products	24-Dec-01
AS/ACIF S009 - 2006	Installation requirements for Customer Cabling (Wiring Rules)	
Communications Cabling Handbook SAA HB29 2000	Segregation distances of cables refer to	
AS 1170.1-1989: Part 1	Loading Code AS 1170.1-1989: Part 1 – Dead and live loads and load combinations	
AS 1170.2-1989: Part 2	Loading Code AS 1170.2-1989: Part 2 – Wind Loads	
AS 1199.1-2003	Sampling Procedures for inspection by attributes – Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection	28-Jul-2003
AS 1720.1-1997: Part 1	Timber Structures AS 1720.1-1997: Part 1 – Design Methods	
AS 3700-1998	Masonry Structures AS 3700-1998	
AS 3815 - 1998	A Guide to Coaxial Cabling in Single and Multiple Premises	5-Apr-98
AS 4055-1992	Wind Loads for Housing AS 4055-1992	
AS 4100-1998	Steel Structures AS 4100-1998	

Note: FOXTEL specifications are to be used if they are higher than the referenced standards.

Appendix E. Installer Product List

The latest Installer Product List (IPL) is available on the FOXTEL Web Site WWW.foxtel.com.au

The IPL is updated on a regular basis, therefore the website should be checked on a regular basis to ensure the most up-to-date list is being used.