



Document Reference TM00140-1 Sanctuary Cove - Home Cabling Requirement Spec v1-6.doc

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Version	Date Issued	Reason for Update
0.5	22 July 2008	Re-arrange to reflect SC comments, and add correct SC logo
0.6	16 August 2008	Updates to ensure mandatory elements are clear and not tied to Smart Wiring, but Australian Standards, and Sanctuary Cove requirements
0.7	18 August 2008	UCG review completed – ready for SC review
0.8	15 September 2008	MJG Reviewed and returned to UCG for review
0.95	23 September 2008	UCG review of MG comments – accepted most, and clarified RF levels requirement – reviewed with MG
1.00	9 October 2008	Formal release
1.1	22 October 2008	Updates to security requirements – panic button, and installer table (4.2.8)
1-3	10 July 2009	Final review and release (remove reference to existing homes – i.e. this is for new homes only)
1.4	29 August 2009	Updated with drawings of NTD cabinet, and added reference to check list TM00140-1 AT001
1.5	04 January 2010	Austar dual outlet requirement added in section 4.2.6
1.6	29 April 2010	Addition of 4.2.8.1 – IP alarm panel cabling requirements



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## **1. Introduction**

### **1.1 Purpose and Effect**

The purpose of this Technical Manual (TM) is to record the statement of requirements for the Sanctuary Cove FTTH resident home cabling to facilitate FTTH (Fibre To The Home).

### **1.2 Audience**

The audience for this document is:

- UCG Operations
- UCG Management
- Sanctuary Cove Residents, their Builders and Architects
- Sanctuary Cove Management/PBC

### **1.3 Background**

Sanctuary Cove has contracted UCG to provide installation and maintenance services, and separately contracted a Fibre Plant construction contractor for design, and deployment of the required fibre plant for the Sanctuary Cove FTTH network. This document is intended to provide the minimum standard required for home cabling to interwork with the FTTH network and some recommended standards to be adopted that will allow the full potential of the new FTTH network to be realised in terms of home automation and residents lifestyles.

This document and subsequent variations, is subject to agreement between UCG Management, Sanctuary Cove Management.

### **1.4 Scope**

This TM documents the functional and technical requirements for the resident home cabling from the Primary Home Distributor (PHD) to the wall outlets for various services. This covers;

Network Demarcation

Interface from Network to PHD

Cabling from PHD for TV, telephony and data



## 1.5 Reference Documents

The documents referenced are as follows:

- UCG RFT response (relevant sections repeated in this document)
- AS NZS ISO IEC 15018-2005 Information technology - Generic cabling for homes
- AS/ACIF S008:2006; Requirements for customer cabling products
- AS/ACIF S009:2006; Installation requirements for customer cabling (Wiring rules)
- HB 29—2007; Communications Cabling Manual: Module 2; Communications cabling handbook
- FUNCTIONAL SPECIFICATION Ver 1.2

## 1.6 Glossary

BER	Bit Error Rate
BO	Broadcast Outlet
CPE	Customer Premises Equipment
CCTV	Closed Circuit TV
EMC	Electromagnetic Compatibility
FTA	Free To Air (TV)
FTTH	Fibre to the Home
HD	Home Distributor
HE	Head End
HVAC	Heating, Ventilation and Air Conditioning
IP	Internet Protocol
IPTV	IP Television
MATV	Master Antenna TV
MDP	Media Distribution Point
MDU	Multiple Dwelling Unit
NTD	Network Termination Device
ONU	Optical Network Unit
PBC	Principle Body Corporate
PHD	Primary Home Distribution
PSU	Power Supply Unit
RF	Radio Frequency
SDU	Single Dwelling Unit
STU	Set Top Unit
TO	Telecommunications Outlet
UCG	Universal Communications Group
VoD	Video on Demand
VoIP	Voice over Internet Protocol



## 2. Summary

### 2.1 Objectives

This document for Sanctuary Cove PBC is to define cabling standards to be applied to all new homes to be built in Sanctuary Cove. This also defines the minimum requirements for all homes in Sanctuary Cove to be connected to the FTTH network.

Sanctuary Cove requires a minimum standard of wiring in every new home to allow for the easy integration with the Sanctuary Cove FTTH Network. Section 4 in this document defines the minimum standard of home television, telephone and data cabling that shall be mandated in the Sanctuary Cove building by-laws.

UCG and Sanctuary Cove recommend the installation of Smart Wiring to ensure that all future residents have convenient access to all services. In general Smart Wiring, if implemented correctly, is fully compliant with the standards defined in Section 4. However, all contractors MUST ensure minimum compliance with the specifications in section 4.

A typical Smart Wired system is shown in Figure 1 below.

Smart Wiring for telecommunications offers the following benefits:

- telephone and broadband Internet access at any Smart Wired outlet
- interconnection/sharing of Ethernet devices such as personal computers, printers, network media players, etc.
- access to Internet-based entertainment at any Smart Wired outlet, e.g. on-line games, Internet protocol TV (IPTV), Internet radio, on-line videos
- free-to-air (FTA) TV and pay TV access at any Smart Wired outlet
- distribution of TV signals from the home entertainment centre or media room (e.g. from a personal video recorder) to Smart Wired outlets in the other rooms
- digital media streaming from the home entertainment centre or media room to Smart Wired outlets in the other rooms.

In addition to the structured telephone, data (Internet) and TV cabling described in this document, Smart Wiring may optionally include:

- home security — intruder detection, back-to-base monitoring or CCTV (Closed Circuit Television)
- home theatre and/or in-home audio/video distribution
- home automation — “intelligent” lighting, automatic/remote control of electrical appliances, HVAC (Heating, Ventilation and Air Conditioning), automatic lawn/garden irrigation, etc.

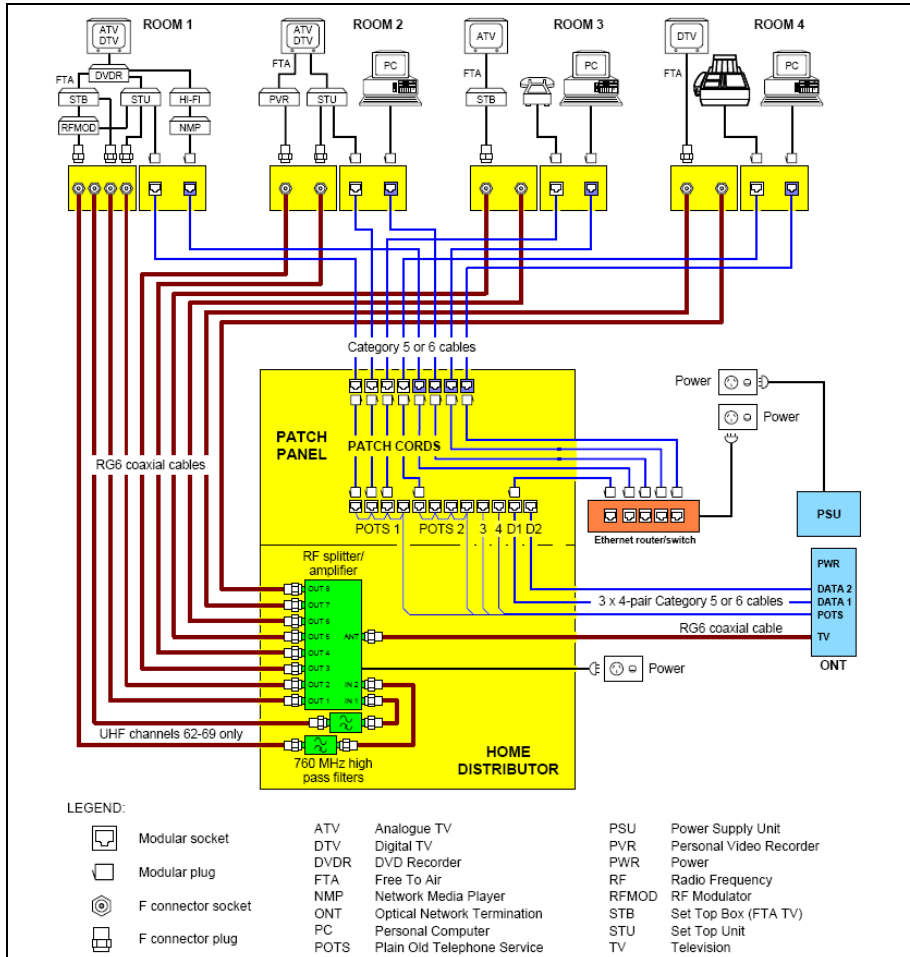
Smart Wiring must be undertaken by an appropriately registered cabler with the ACMA.

**Status:**

Released



### 3. Smart Wired Functional Overview



**Figure 1: Overview diagram of home cabling**

A Smart Wired home is cabled for today's technologies, but with capability for the future. Whilst each of the elements within a Smart Wired home are not in themselves new, it is important to understand that there are two broad areas to consider. Firstly, there is the cabling infrastructure. It is the backbone of any control or media delivery system to be installed into the dwelling. The product sets to be installed in this broad area all exist without Smart Wiring. The difference is how they are installed; in essence, the configuration and quantities to enable current technologies and prepare for future technologies. These systems are not home automation systems, but give the cabling infrastructure and termination systems to enable home automation to be incorporated into a home.

Secondly, there is the automation of the home. This is a much more complex area of installation from the point of view of component requirement and programming. There are a number of electrical component vendors with proprietary systems to provide home automation, which is covered in more detail in section 5 of this document



## 4. Sanctuary Cove FTTH Mandatory Cabling Requirements

### 4.1 Overview

#### 4.1.1 Connection from FTTH Network to a Residence

The Sanctuary Cove FTTH Network consists of a head end, a fibre cable from head end to a pit outside a residence, and then a fibre cable through a conduit (or pipe) to the location in the residence where FTTH Network NTD (Network Termination Device) is located. The NTD provides cables interfacing to telephone, data and television network cabling in a residence.

The head end is centrally located in Sanctuary Cove where all connections to the outside world and connections to common services are supplied and managed.

The NTD consists of a box that homes components to terminate optical fibre signals into electrical signals that are able to be used in standard home wiring.

The cables from the NTD are fed into a HD (Home Distributor), where connections are made to each service outlet in the home.

#### 4.1.2 Home Distributor

The HD is the most important part of the home wiring and the selection of the most appropriate size is critical to the success of the initial home wiring, and any future alterations.

In large residences it may be appropriate to install more than one HD, although the one that connects to the NTD is called the PHD (primary HD), whilst the other HD's are known as secondary HD's. Primary and secondary HD's are functionally the same, except the PHD may be larger and have more power requirements to service more active equipment.

Only one HD is mandatory, but a secondary HD may make the home cabling less complicated in some circumstances.

#### 4.1.3 Communications

Communications in a residence in Sanctuary Cove includes telephony, broadband, Subscription TV and will ultimately also support digital Video on Demand and IPTV. To successfully deliver all these services reliably, it is mandatory that a new home in Sanctuary Cove has a standardized cabling methodology that conforms to Australian Standards. All communications cabling is to be terminated in a Home Distributor (HD). Cabling is reticulated in a Star Configuration from the HD allowing patching of the cabling wherever a signal is required in the dwelling.



#### **4.1.4 Security**

All homes in Sanctuary Cove must be connected to the FTTH network for the provision of security services. The mandatory requirements defined in this document will ensure reliable connectivity to this service.

#### **4.1.5 Video**

In a Sanctuary Cove residence, video is broadly regarded as reticulated Pay TV and Free-To-Air television. It would however, also include other video sources that need to be routed throughout a residence. As with communications, the video cabling from any other source shall terminate on patch panels within the HD. Cabling throughout the home shall be reticulated in a Star Configuration from the HD to allow patching of cabling wherever a signal is required in the home.

### **4.2 Mandatory Requirements**

#### **4.2.1 NTD and HD Location and Space Provision**

The NTD and HD shall be installed in the garage, adjacent to the Electrical Switchboard, and located next to each other as shown in figure 2 below.

The lead in conduits shall terminate at the NTD. The conduits shall be contained in the wall cavity. The lead-in fibre will be installed at the same time as the NTD installation.

The NTD dimensions are shown in **Figure 3**, and is able to be recessed with 60mm protruding to allow for the door. The NTD has entry holes for the incoming fibre and the cables connecting to the HD in its base.

#### **4.2.2 NTD to HD cabling**

The contractor performing the home cabling must install two 25mm conduits between HD location and NTD.

If the HD location does not conform to the requirements in figure 2, then the cabling contractor must install:

- 1 x coax cable (quad shield RG6)
- 4 x Cat 5 cable
- 2x telephone cable
- And a double 240v ac 3 pin power socket 200mm below the NTD location.

The FTTH Contractor, on behalf of Sanctuary Cove PBC and the resident, will install an NTD as specified in this document.



### **4.2.3 Home Distributor (HD)**

Carrier telephony and broadband services shall be terminated at the NTD, typically adjacent to the Electrical Switchboard or as agreed between the carrier and the customer according to AS/ACIF S009:2006.

The installation of all equipment related to the HD inclusive of the cabling and termination in the HD and throughout the home shall be the responsibility of the contractor. This includes the mounting of housings, installation and termination of all cabling and equipment associated with the reticulation and termination of all communications cabling. Provision of cabling is also to be supplied and installed by the contractor.

This unit is the main distribution point for all infrastructure cabling and is the point from where cabling may be star-wired throughout the home. It allows a central point for patching services.

This unit shall be capable of terminating all incoming communications and video cabling and reticulating cabling throughout the home via patch panels.

The HD shall be capable of mounting and powering a data switch, enabling patching of a LAN throughout the home and a data switch or router for provision and reticulation of data services as a minimum.

It shall be capable of mounting and powering an RF distribution system to reticulate multiple audio/video RF feeds throughout the home.

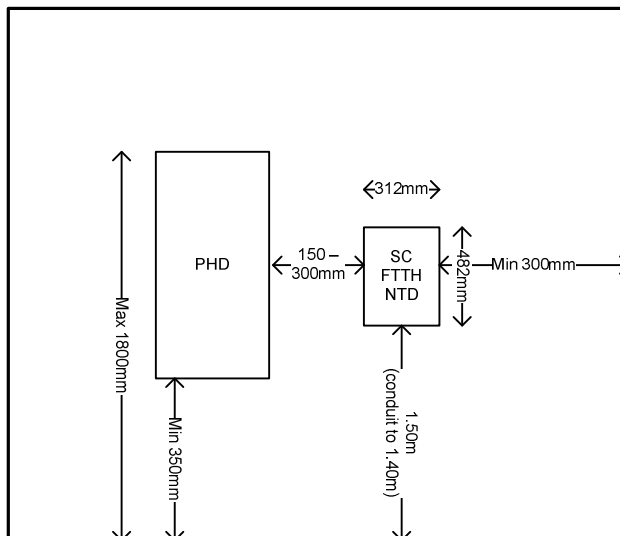
It shall have 240vac power outlets incorporated into the design and shall maintain all separation and segregation from other services according to Australian Standards. Power in the HD shall be supplied as a separate circuit to other electrical services in the home.

The HD shall have 30% spare capacity as a minimum when first commissioned. This will allow for future technologies to be incorporated into the system.

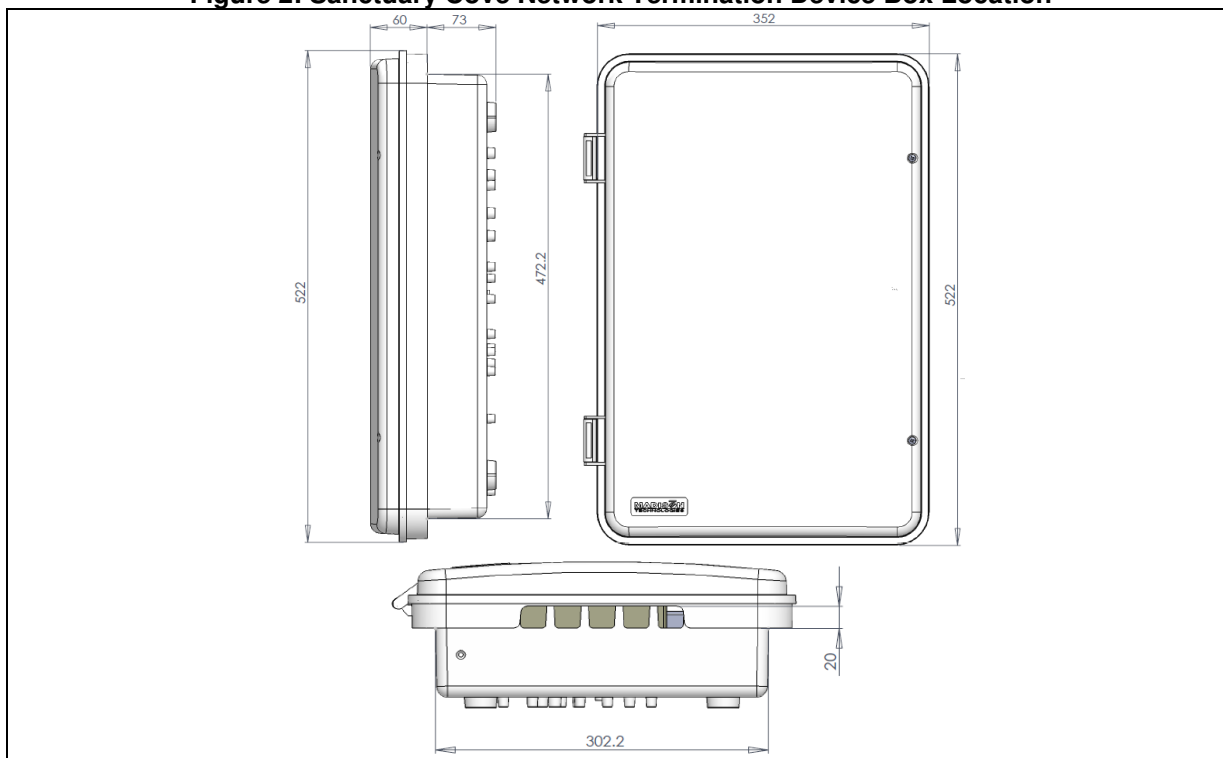
The unit shall be provided with a lockable door and shall be mounted in a well ventilated clean garage free from dust and moisture, easily accessible for installation and maintenance purposes.

The HD shall be located either to the left or right of the NTD as shown in figure 2, unless the additional conduit and cabling, and power points have been installed as per 4.2.2 (NTD to HD Cabling)

The HD shall provide a spare 240v 3 pin sockets to provide power to the NTD. This shall be clearly labelled as such



**Figure 2: Sanctuary Cove Network Termination Device Box Location**



**Figure 3: Sanctuary Cove Network Termination Device Box Dimensions**



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#### 4.2.4 Sanctuary Cove FTTH Home Cabling Sticker and records

There shall be a Sanctuary Cove FTTH Network Cabling sticker on the inside door of the HD, clearly indicating the approved installer who performed the installation.

The sticker form is titled "Sanctuary Cove FTTH Home Cabling Record" and features a purple header. It includes the following fields and elements:

- Name of Contractor:** A long horizontal text input field.
- Registration Number:** A horizontal text input field.
- Phone Number:** A horizontal text input field with a "( )" placeholder.
- Your cabling records are located:** A horizontal line for handwritten text.
- Sanctuary Cove FTTH Network Home Cabling Acceptance Date:** A horizontal line with slashes for date entry.
- By:** A horizontal line for signature.
- Logos:** The Universal Communications Group logo (a stylized knot) and the "tomorrow's communications today" slogan are in the top right. A larger version of the "three figures" logo is in the bottom right.

**Figure 4:** Sanctuary Cove FTTH Network Home Cabling contractor label

There shall be a facility for keeping records and cabling drawings on the inside of the lockable door. Records shall be kept and remain up to date, in accordance with Australian Standards for the installation. Records shall incorporate terminations, patching and drawings of the installation. Records shall be in pencil to allow for easy updating. There shall also be a parts list of all functional components installed within the HD as a part of the records.

This sticker will be found on the inside of the HD door and identifies the approved installer. It also identifies whether the home is pre-wired for the Sanctuary Cove FTTH network and is compliant to this and the relevant Australian Standards. This sticker indicates where the records and diagrams for the installation are located



#### **4.2.5 Communications (TO)**

The contractor is responsible for all cabling in and beyond the HD.

All cabling shall be in accordance with Australian Standards, particularly AS/ACIF S009:2006 and such cabling shall be installed, terminated and tested by an appropriately registered cabler with the ACMA.

Cable type - Each socket is individually cabled from the HD using 4-pair, unshielded twisted pair, Category 5e or Category 6 cable that complies with Australian Standard AS/NZS 3080 (ISO/IEC 11801), "Telecommunications installations — Generic cabling for commercial premises". This cable has solid conductors. Do not use any cable with stranded conductors for the TO cabling. The sockets should be rated at Category 5e or Category 6, as applicable, to match the cable rating.

All communications cabling shall be in a star topology from the HD. All communications services shall transit the HD via patching.

All cabling shall be run in accordance with Australian Standards, with particular attention to separation and segregation from other services. In ceiling spaces, cabling shall be attached to catenaries as a minimum to maintain cable integrity, ensure separation from other services and to aid maintenance in the future.

The home shall be cabled with a minimum of one dual outlet per room. However, two (2) dual outlets on diagonally opposing walls is recommended.

Cabling shall be a minimum of Category 5e cabling according to AS/NZS 3080. Terminations shall be on 8 pin Modular Jacks (RJ45 connectors). Services to be incorporated into the home will be patched at the HD to required rooms. There shall be dual structured cable outlets within two (2) metres of where a PayTV STU will be positioned and ideally, these would be located within the same outlet.

Maximum cabling distances shall be maintained according to AS/NZS 3080 in all cabling runs.

Allowance should be made for a minimum of a 10/100Mbps data switch or router in the HD to enable a LAN throughout the home. It is considered efficient to mount the switch in the HD to allow easy patching to the structured cable system.

Standard patch cables shall be supplied by the contractor in lengths and numbers to allow patching of any service within the HD. The patch leads shall be supplied in lengths that ensure no excessive length is encountered when the patch leads are used. Cable management shall be provided and used within the HD and there shall be storage capability for unused patch leads.

Following installation, all cables shall be tested according to AS/NZS 3080 and results shall form part of the system documentation and records. These test results would typically be provided on a CD-ROM or similar.



Notes:

1. The current Category 5 standard is equivalent to the old “Category 5e” standard. Cable manufactured to the current Category 5 standard may still be called or marked “Category 5e”.

2. Category 5 cable is rated at 100 MHz and should support Gigabit Ethernet (1 Gbps). Category 6 cable is rated at 250 MHz and may support future 10G Ethernet (10 Gbps). Category 6 cable and sockets are more expensive but may support future technologies that Category 5 won't.

Category 7 cable and sockets may be used instead of Category 5 or Category 6 cable and sockets. However, Category 7 cabling is quite expensive and is difficult to justify for home cabling at this time.

Note: Category 7 cabling is shielded and rated at 600 MHz. It may extend the useful life of the cabling system because it may support future applications that Category 5 or Category 6 cabling won't support but which are currently supported by coaxial cabling (e.g. broadband video) or which may be more economically supported by optical fibre in the future (e.g. 100 Gbps Ethernet).

#### **4.2.5.1 Cable length**

The total length of cabling between the NTD and any TO must not exceed 100 metres (unless terminated and retransmitted via a data switch, hub or router – this restriction still applies from NTD to this re-transmission point). This includes the cable from the NTD to the HD, the cable from the HD to the TO and the patch cord at the HD. This limit is not likely to be exceeded in most homes.

Note: This is a signalling limitation of the NTD and is not related to cable length limits specified in generic telecommunications cabling standards.

#### **4.2.5.2 Cabling method**

TO's should be “star wired” (cabled individually) from the HD with a socket terminated at each end of the cable; one at the TO and one at the HD patch panel. Use cables with different sheath colours, e.g. blue and grey for the TO sockets. Alternatively, mark the cable sheaths at each end, e.g. “Blue” and “White” for the corresponding socket colours. Do not use cable with red sheath, as red is normally associated with fire detection/alarm systems.

In addition, mark each pair of cables at each end in numerical sequence (i.e. “1”, “2”, “3” and so on). The TO wall plates and the corresponding patch panel sockets at the HD will eventually be numbered the same way, so that the end-user will be able to readily identify them.





### 4.2.5.3 Cable handling precautions

Category 5e and Category 6 cables must be installed with care to ensure maximum performance. Stretching, sharp bending, kinking, crushing or jointing of the cable must be avoided to ensure that the pair twist and conductor spacing are maintained.

When installing the cables:

Keep at least 150 mm (preferably more) away from power cables and appliances whether or not there is an interposing barrier. Where it is necessary to cross power cables, cross at right angles.

Avoid excessive tension when pulling cables in and don't allow any kinks or knots to form in the cable.

Ensure that any bend in the cable has a bend radius greater than 8 times the cable diameter.

Ensure that the cable is evenly supported, protected from crushing or trampling during and after installation, and that the cable sheath is not appreciably distorted by mechanical protrusions, cable ties, clips or other securing devices.

Do not staple the cable. If the cable needs to be supported or restrained within a building cavity (e.g. to keep it out of harm's way or to maintain separation from other services), use loose fitting devices such as conduit or conduit saddles. For surface runs on walls, use plastic trunking or conduit to house the cable.

Make each run of cable as short and direct as possible while ensuring that the above requirements are met. Allow for 200 mm to 500 mm of slack cable to be left at each end after termination of the cable.

Don't joint/splice the cables. If any cable is damaged or too short, replace the full length of cable rather than repairing with a joint/splice.

Don't tee or tap off any cable. Only connect one TO socket to each cable.

### 4.2.6 Video (BO)

Reticulation of video services is based on supporting both Sanctuary Cove FTTH Network and PayTV requirements as this is the primary source of video into a residence at Sanctuary Cove. The installation of all equipment related to video services, inclusive of the cabling and termination throughout the home, shall be the responsibility of the contractor.

From the HD, a minimum of four (4) RG6 quad-shield cables run from the HD and terminated at wall outlets adjacent to where the PayTV STU is to be situated (typically the home entertainment/theatre room) using 2GHz Compression F type connectors. **Note: for Austar connections these are to be terminated in a dual outlet wall plate – each cable terminated to run back to home hub. (if this is not done Austar will not install at this address)**

For each other room potentially requiring video, there is to be a minimum of two (2) RG6 quad-shield cables run from the HD and terminated at wall outlets using 2GHz Compression F type connectors. It is recommended that two additional cables be run from the HD to



diagonally opposing walls in each room potentially requiring video services.

The contractor is required to test the video cabling system and also provide appropriate patch leads in length and numbers, to allow video services in all required rooms. If a video distribution system (e.g. for video surveillance) is utilized this must be set at a frequency above 820MHz.

#### **4.2.7 TO and BO Power Outlets**

Power outlets for TOs and BOs

It is recommended that 240 V power outlets be provided near all TOs and BOs for powering of customer equipment. This is in addition to the power outlets required at the HD as described in 4.2.1 and 4.2.2.

#### **4.2.8 Security**

The intruder alarm systems are cabled separately using special cable with stranded conductors. A standard system comprises an alarm panel, motion sensors, panic buttons, smoke detectors, rate of rise heat detectors and a control panel. All security alarm systems require a "mode 3" connection to be installed and the first telephone line from the NTD should be connected to the security alarm panel, before it is presented to the HD patch panel. This may be achieved by running a single Category 5e or Category 6 cable between the HD and the alarm panel, with the first telephone line jointed through to the alarm panel within the HD. The line is fed back from the alarm panel using a second pair in the same cable and this pair is connected to the patch panel. Figure 5 below shows this cabling arrangement.

The location of the alarm panel may be selected by the resident, however it is recommended that it be located close to the PHD for simplicity of cabling and testing.

A monitored security alarm should always be connected to the first telephone line even if two or more telephone lines are to be activated.

A security alarm system must be installed, with battery back-up, so that it will still operate during power failure or if the power is switched off at the power mains. The Sanctuary Cove FTTH NTD PSU is fitted with a back-up battery so that the telephone line will work under power fail conditions.

A Security System sticker must be attached to the alarm panel showing the security contractors name, license number and telephone number.

Throughout Australia, there is a requirement for licensing of designers & installers of security systems.

##### **4.2.8.1 IP Security Panels (from May 2010)**

Preparation for IP alarm panels shall be as per 4.2.8, i.e. Category 5e or Category 6 cable between alarm panel and HD. This will be connected through a RJ45 connector in the HD to a port in the ONU allocated for this purpose. Advice on approved IP panels will be issued in due course.

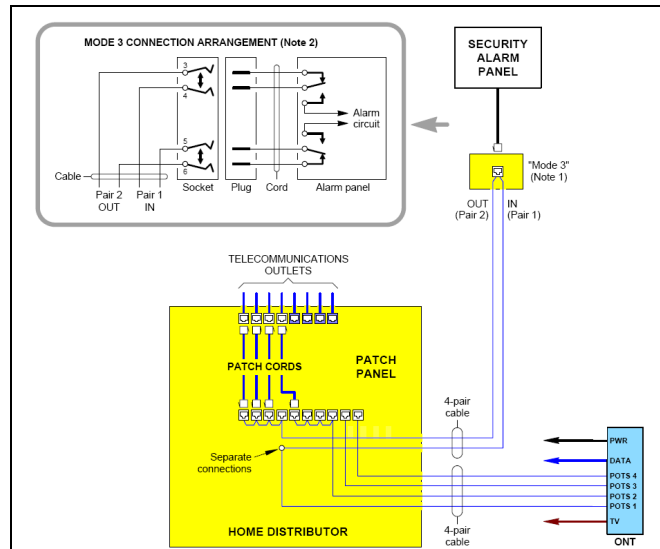


Figure 5: Connection of a monitored (“back-to-base”) security alarm system

Notes:

1. With a “mode 3” connection, the alarm panel takes priority over the line and disconnects all other customer equipment when the alarm is activated. It is important that the alarm panel be the first connection point on the line to which it is to be connected. The alarm panel should always be connected to telephone line 1 (POTS 1) even if two or more telephone lines are activated.
2. The “mode 3” socket may be installed on the wall next to the alarm panel, inside the alarm panel or inside the home distributor (or the alarm panel may even be hard wired). The connection principle is the same in all cases.
3. The Sanctuary Cove NTD/ONT PSU is fitted with a back-up battery.



## 4.2.9 Testing and Documentation

### 4.2.9.1 Testing and commissioning BO

RF Level from NTD will be between 73-78dBuV. The design of the cabling should take this into account to ensure the levels are as per the requirements defined in table 1.

Given that there will be no RF signal at the time of the cable install it is expected that the installer has taken into account the design requirements, and has performed continuity testing for all outlets from the HD. The results for testing are to be recorded and left in the HD. The cabling installer is to certify all cabling has been installed and tested to meet requirements defined in this specification document.

Outlets will be tested when the NTD is installed with a field Strength meter and the test results recorded and submitted as part of the technical manuals. A copy of the test results will be left in the HD for the end user as proof of compliance.

**NOTE: non-conformance will be notified to the home owner, and is the responsibility of the home owner and cabling contractor to attend to any non-conformance notified.**

All TV outlets must have signal strength as per Table 1 below for analogue and digital channels.

**SYSTEM LEVELS OVER ALL SYSTEM OUTLETS**

Broadcast System type		Outlet Level, dB $\mu$ V					
		Single Dwelling		Multiple Dwellings			
		Min.	Max.	$\leq 20$ RF Channels		$>20$ RF Channels	
Min.	Max.			Min.	Max.		
FTA	Analog TV	60	86	60	80	60	77
	DVB-T	45	80	50	74	50	71
DVB-S (QPSK)		50	86	54	80	54	80
DVB-C	64-QAM	47	73	50	70	50	70
	128QAM	—	—	[53]	[70]	[53]	[67]
	256QAM	—	—	[55]	[70]	[55]	[67]
T-DAB (QPSK)		30	74	35	68	35	65
FM Radio		45	80	54	70	54	70

**Table 1: RF levels at Wall Plate – AS NZS 1367-2007**

**NOTES:**

1 The Analog TV output level is the rms voltage of the vision carrier peak sync, measured nominally at the vision carrier frequency in greater than 200 kHz bandwidth.

2 The levels for DVB-T given in this table apply to modulation parameters of 64-QAM with FEC 2/3 or 3/4. Other modulation parameters may change the levels specified.



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- 3 The DVB-T output level is the channel power expressed as an rms voltage in 75  $\Omega$  of the service measured in a 7 MHz bandwidth.
- 4 The DVB-S output level is the channel power expressed as an rms voltage in 75  $\Omega$  of the service measured within a 32 MHz bandwidth (subtract 15 dB to give 'dB $\mu$ V/MHz' spectral density) for reception under clear sky conditions.
- 5 The DVB-C output level is channel power expressed as a rms voltage in 75  $\Omega$  of the service measured in a 8 MHz bandwidth. Contact Service Provider for the level required for 128QAM and 256QAM.
- 6 The T-DAB output level is channel power expressed as a rms voltage in 75  $\Omega$  of the channel measured in a 1.5 MHz bandwidth.
- 7 The FM Radio output level is the rms voltage of the carrier measured nominally at the FM carrier frequency in greater than 200 kHz bandwidth.
- 8 The satellite antenna may receive non-required signals. The level of these signals at the systems outlet shall not exceed the maximums specified in Table 9.1. However, these signals may have levels less than minimums.
- 9 The 54 dB $\mu$ V specified for the minimum level of DVB-S in multi unit dwellings is to allow for domestic cordless 1.8 GHz band phones (DECT system) potential interference.



The differences between RF levels at the wall plate outlet must conform to Table 2 below.

**CHANNEL LEVEL DIFFERENCES AT A SYSTEM OUTLET (WALLPLATE)**

Service type		Maximum level/channel power differences at a Wallplate, dB		
Standard	Modulation type	Full B/W	Narrow B/W (10 channels)	Adjacent channels
DVB-T	COFDM 64QAM	18	15	12
DVB-S	QPSK	10	na	10
DVB-C	all	12	6	3
T-DAB	QPSK	18	na	12
DVB-T higher than adjacent Analog TV		na	na	3
T-DAB higher than adjacent Analog TV (Band III)		na	na	-12
T-DAB higher than adjacent Digital TV (Band III)		na	na	-6
DVB-C higher than adjacent Analog TV		na	na	3
FM Radio higher than Analog TV		-6	-6	-6

na = not applicable

**Table 2: RF Difference levels measured at wall plate: AS NZS 1367-2007**

All TV outlets must have a PASS on the BER Test (bit error rate) of 3 stars or better for all digital channels.



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The record sheet for all test results shall be in the following format:

HD FTA Feed In					
	Analogue Signal		Digital Signal		
Network	Channel	Signal Strength	Channel	Signal Strength	BER
ABC					
TEN QLD					
SBS					
WIN					
7QLD					

HD FTA Wall Outlet 1-N					
	Analogue Signal		Digital Signal		
Network	Channel	Signal Strength	Channel	Signal Strength	BER
ABC					
TEN QLD					
SBS					
WIN					
7QLD					



### 4.2.9.2 Testing and commissioning TO

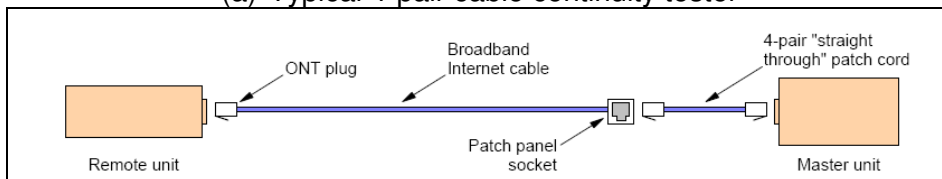
#### 4.2.9.2.1 Testing Cat5/6 cables

As long as cables have been installed properly (in accordance with section 6.1) and terminated correctly (in accordance with section 6.1) in homes where cable runs are relatively short, it should only be necessary to perform a “wire map” test on the TO cabling to verify correct cable connections.

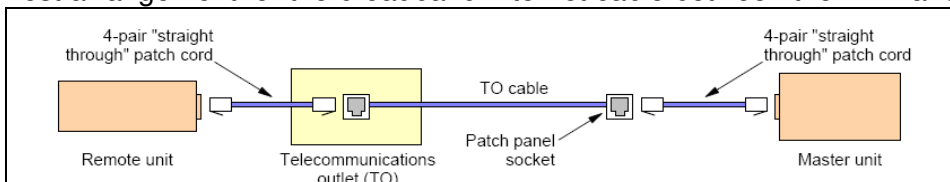
Do this using a 4-pair cable continuity tester that tests for open circuits, short circuits and mis-wiring. Test the broadband Internet cable between the NTD and the HD and all 4-pair cables between the HD and the TO's. A typical continuity tester and the test arrangement are shown in Figure 6 below.



(a) Typical 4-pair cable continuity tester



(b) Test arrangement for the broadband Internet cable between the NTD and the HD



(c) Test arrangement for cables between the HD and the TOs

**Figure 6: Testing of Cat5/6 Cables**





Notes:

1. The tester should test for correct wire mapping (pair allocation), split pairs, short circuits, open circuits and reversals.
2. Some testers, such as the one shown above, can also be used for simple testing of the TV (coaxial) cabling. Suitable F connector to BNC adaptors may be required for such testing.

#### **4.2.9.3 Labelling**

All TV cabling located in the HD and the wall outlet must be labelled by use of Cable flags or equivalent.

All data cabling must be labelled at the patch panel and the wall outlet via the use of the C2000 ID labelling system or equivalent.

#### **4.2.9.4 Documentation**

It is a requirement that the system be fully documented. Documentation shall include the following as a minimum:

Block diagrams depicting overall system configuration and operation of each sub-system.

Handbooks for any items of proprietary equipment.

Fully annotated interconnection wiring diagrams and circuit diagrams.

Full parts listings of all components used in the system, including manufacturers part number.

Details of operating procedures for the overall system.

#### **4.2.9.5 Test Documentation**

Drawings showing site installations, location of equipment, wiring runs, etc. The contractor shall provide copies of all test and inspection documentation, which relates to the design and the supply of the system. Commissioning and acceptance procedures shall be written by the contractor and approved by the Principal Body Corporate, prior to any system installation being accepted.

#### **4.2.9.6 Certification**

The cabling contractor shall certify that all cabling has been installed to this specification.

**NOTE: non-conformance will be notified to the home owner, and is the responsibility of the home owner and cabling contractor to attend to any non-conformance notified.**

**The cabling contractor shall complete form TM00140-1 AT001 - Home Cabling Installation Check List and leave a copy in the HD document folder.**



## **4.3 Safety and Reliability**

### **4.3.1 System Safety**

The system, when installed and commissioned, shall present no physical danger to either users of the system or to the members of the public.

### **4.3.2 User Safety**

All equipment which users of the system could reasonably be expected to come into contact with shall be designed, supplied and installed, such that no physical hazard is presented to them. All mains powered electrical equipment and metal enclosures shall be earthed. All hazardous voltages shall be contained within appropriate enclosures and suitable warning labels shall be fitted. All levels of electromagnetic radiation will be within those levels prescribed in the relevant Standard. The system shall be designed, supplied and installed such that persons engaged in system maintenance will be in no physical danger, when following prescribed maintenance procedures.

### **4.3.3 Earthing**

All system earthing shall be carried out in accordance with AS3000. Care must be taken to ensure that all exposed metalwork is earthed. The design should also ensure that no earth loops are present which could degrade image quality.

### **4.3.4 Environmental Considerations**

The equipment supplied and installed shall be designed to operate satisfactorily, 24 hours a day and in all weather conditions which may be expected in the location of the installation.

### **4.3.5 Electromagnetic Compatibility**

All equipment employed in the system shall be immune to the effects of any conducted or radiated emissions. These include sources such as power lines, radio transmitters/receivers, portable telephones etc. Each item of equipment employed in the system shall be compliant with the relevant Standard on EMC emissions, both conducted and radiated. As a minimum all installed equipment shall comply with A-Tick and C-Tick requirements and where relevant, documentation evidencing successful compliance testing shall be provided.



## **5. Custom Components Advisory Standard**

### **5.1 Overview**

#### **5.1.1 Smart Wiring**

For additional services over and above those defined in Section 4 it is recommended that the standards proposed under the Smart Wired guidelines are adhered to. For Home Theatre and audio applications a Media Distribution Point (MDP) could be located next to the Media Room and connected to the HD for distribution of Telephony, Data and TV services.

#### **5.1.2 Audio**

Where there is to be a centralized audio system, the equipment may be situated in the Home Theatre equipment area or may be an extension of the MDP.

##### Home Theatre

The Home Theatre environment in a Smart Wired home is to be regarded as a specific technology area. Typically, customers are quite emotional regarding the design and feel of the room. The Home Theatre generally incorporates power, lighting and automation (this may include automated curtains, screen and projector also). It will also require access to all source devices such as audio systems, DVD players, tuners, and computers for MP3 applications and such like. Design needs to be carefully considered to minimize noise, heat and light from LED's whilst still allowing access to change CD's, plug in MP3 players and video recorders etc whilst maintaining the ability to utilize infrared controllers to perform normal functions of these machines.



### **5.1.3 Irrigation**

Whilst the Smart Wired home is capable of controlling many electronic functions around the home, it is also possible to control the home irrigation system as a part of that system. The consideration here is really about providing for any eventuality and running cables to enable the use of such control into the future.

### **5.1.4 Power, Lights and Automation**

As with any home, there is a basic requirement for power and lighting. The addition of automation opens a whole new world of design of those lighting and power systems that would be senseless in a normal home. The idea of specialist floor lighting for shift workers that turn on as you walk down the hall and turn off as you pass by or timing certain lights or power points on with a call from your cell phone are now able to be wired into your home. A number of vendors offer proprietary systems for automation and two of the most prominent in Australia are Clipsal C-Bus and HPM iControl. However there are a number of open standards based products such as KNX which have the benefit of multiple vendors for a range of controllers and sensors.

## **5.2 Optional Requirements**

### **5.2.1 Audio**

Audio should be routed via the MDP as this allows for flexibility of services throughout the home into the future and allows for future technologies. However, where a distributed audio system is utilised, this is negated as the distribution system is capable of providing switching between zones. This zone switching allows for the flexibility otherwise required through the MDP patching. Where an audio distribution system is used, it is important that the system is capable of accepting an external audio source to provide maximum flexibility. The cable and terminations of audio systems varies widely depending on many criteria. These may include the source equipment, the distribution equipment, terminations and such like. Where an audio distribution system is incorporated into the design, this is typically situated with the Home Entertainment/Theatre equipment to allow flexibility of audio sources. Cable reticulation shall be 1 x Cat 5e cable 2 x Figure 8 Audio Cable From the MDP to each speaker position this allows the deployment of different types of distributed audio systems. NB: In room where speakers are installed you must have cabling for the use of IR distribution for control purposes.

### **5.2.2 Home Theatre**

This is an area of the Smart Wired home that is totally dependent on the equipment purchased and the specific requirements and budget of the customer. Essentially, the cabling for the Home Theatre consists of video for the interconnection of video devices to the display device and the audio cabling for the sound system.

Video cabling is typically a minimum of RG59 and connectors could be RCA or BNC type



connectors. The video system may be either a composite video solution or a component video installation. Component video as a minimum is preferable however HDMI cabling is the latest standard for high definition transmission.

Audio cabling as a minimum would be 22awg multi-stranded figure-8 cable terminated with RCA unbalanced connectors. Again, there are a vast number of higher quality cables and connectors that may be used and this is determined by chosen equipment and the customer budgets. The audio system in a home theatre is a Dolby 5.1 solution as a minimum, requiring two front, two rear, one centre speaker and a sub-woofer.

When designing a home theatre solution, thought must be given to a number of criteria when installing equipment. The display device should be sized correctly to the room. The type of display device (e.g. forward projection and screen, LCD screen, Plasma screen) is a user choice.

Connection requirements should be checked prior to design of the system as cabling can be considerably different depending on type and manufacturer. Equipment needs to be placed to minimize fan noise, whilst maintaining ventilation of the equipment. There remains a requirement to be able to change media in the equipment such as CD ROM's so access remains important.

IR accessibility is also a consideration when positioning equipment.

There is a requirement for access to the LAN within the Home Theatre. A PC connected to the LAN with USB2.0 is important to allow use of MP3 players and such like. This requires that there be at least 2 dual structured cabling outlets in the Home Theatre environment. The additional outlets also allow the ad hoc connection of laptops and other devices that may be required for playback in the home theatre.

Where the STU is positioned in the Home Theatre environment, there needs to be a structured cabling outlet within 2 metres of the PayTV STU for —pay-per-view and video on demand.

Automation can be an important consideration in a Home Theatre and this may include lighting, automated screen, projector automation (operation and/or mechanical movement from the ceiling space) and curtains.

### **5.2.3 Security CCTV & Monitoring**

The contractor shall be a licensed designer and installer for security systems in Queensland.

The installation of all equipment related to the CCTV security system inclusive of the connection to the remote surveillance sites shall be the responsibility of the contractor. This includes the mounting of cameras and housings, installation and termination of all cabling associated with the video equipment, all monitoring, recording, transmission and networking hardware.

Provision of cabling is also to be supplied and installed by the contractor. Design and installation of Security systems shall be by licensed designer and installer. Generally, cabling used for intrusion detection is a 4 core 14/020 cable.



There is a standard requirement for allowance to be made for back to base alarm monitoring. This requires a mode 3 connection available to the security system from the home distributor. All proposed security systems including drawings are required to be submitted to the Sanctuary Cove Security Manager for approval before installation can be commenced.

#### **5.2.4 Irrigation**

Irrigation systems are capable of providing automation of watering systems and sources of water to be used based on such things as time and soil moisture content. These irrigation systems may be capable of turning on/off watering systems (and of course, they may be indoor or outdoor) and opening/closing valves to different water sources e.g. mains water, tank water, grey water.

The typical cabling requirements for these systems are structured cabling to the controllable device. There is typically a control box often situated in the garage or in a weather proof outdoor box.

The structured cabling should cable to the home distributor as with all structured cabling and be patched to the irrigation system to allow for flexible installations.

#### **5.2.5 Power, Lights and Automation**

The installation of all equipment related to the home automation inclusive of the cabling and termination throughout the home shall be the responsibility of the contractor.

The contractor is also responsible for the programming of the automation system and provision of control devices for the operation, adjustment and maintenance of the automation system. This includes the mounting of housings, installation and termination of all cabling and equipment associated with the reticulation and termination of all electrical and automation cabling.

Provision of cabling is also to be supplied and installed by the contractor. 240vac power cabling is to be installed according to Australian Standards. Where automation is to be implemented, cabling is to be routed via the relay panels. Typically these are wall mounted and shall maintain enough space to mount all automation hardware with 30% spare capacity.

Depending on the size and design of a home, there may be multiple zones where relay sets are located. Records in each location shall identify locations of other control areas.

The automation hardware shall be enclosed and shall have a lockable door for safety. The area shall be well ventilated and easily accessible for the purposes of installation and maintenance and shall be separated from all other services according to appropriate Australian Standards. The areas shall be free of dust and moisture.

Records shall be maintained for the installation and shall be updated.

Reticulation of cabling to lights, power outlets and equipment shall conform to all relevant Australian Standards and shall maintain minimum separation and segregation from all communications cabling.



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The control cables used in light and power automation shall be in accordance with the manufacturer instructions. Typically these are either figure-8 cable or 240vac rated 4 pair cable and carry a 24-32vdc signal. The control cabling is generally run in a ring configuration however, manufacturer instructions shall be maintained in this regard as commercially available systems may differ from each other in topology.

Programming of the system shall be backed up and a copy provided to the customer as a part of the installation process.

The customer shall be trained in the operation of the system and documentation shall be supplied to the customer in a format that allows for future training of other people in the system but also for the programming to be adjusted or changed by others. There shall also be a parts list of all functional components of the automation system installed as a part of the records. System tests on the installation shall be performed and recorded according to Australian Standards and manufacturer requirements as a critical part of the installation procedures.



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## 6. General Requirements

The Smart Wired home is the home that has infrastructure cabling that makes the home capable of implementing current technologies and prepares the home for future technology developments. In a Smart Wired house, where a cable is run, it shall be terminated. Cables shall not be left in walls un-terminated.

### 6.1 Application

There are two types of application of Smart Wired. The first is in a Single Dwelling Unit which is a free-standing home and all services are provided to that dwelling alone. The second is the Multi-Dwelling Unit where it may be a block of apartments or such like. Smart Wired is similar in both situations however, there are some differences in delivery that need to be identified to ensure correct design and installation.

### 6.2 Single Dwelling Unit (SDU)

In an SDU, all services are provided specifically for that dwelling. They are not shared with other dwellings on the same property or adjoining properties. Typically, this would be a free-standing home. The requirements set out in this document are based on an SDU. In an SDU, all services regardless of the delivery mechanism by the Service Provider will terminate in the Home Distributor for reticulation via a star topology.





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## **7. Technical Manual Review**

Both Sanctuary Cove and UCG will review this Technical Manual from time to time and any changes must be agreed between both parties.

### **7.1 Term**

This Technical Manual will commence on the day it is signed by ALL parties and continue for as long as the construction contract remains in force or unless terminated by either party in writing.

~ End of Document ~