

# Cabling of new homes for Telstra FTTP

## Information for builders and cabling providers

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### Summary

This document provides technical guidance to builders and telecommunications cabling providers for the installation of facilities for the supply of services to homes and small businesses via Telstra's FTTP (Fibre To The Premises) network.



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## Information for builders and cabling providers

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### 1 PURPOSE

This document sets out Telstra's requirements for the connection of services using Telstra's FTTP (Fibre To The Premises) network including Telstra Velocity<sup>®</sup>.

This Document and associated documents may be accessed under the "Builders" menu of the Telstra Smart Community<sup>®</sup> website at <http://www.telstra.com.au/smart-community/builders/>.

### 2 SCOPE

This document applies to any building to be constructed for use as a home or to conduct a small business (note that some business services are not supported by Telstra FTTP). It applies to detached buildings (single dwellings) as well as semi-detached buildings (town houses, villas, etc.).

Additional guidelines for cabling of multi-storey, multiple-dwelling units (MDUs) are provided in Telstra Document No. 013234a05, *Information summary for property developers — Cabling of multi-storey units ("apartments") for Telstra Velocity<sup>®</sup>*.

### 3 INTRODUCTION

#### 3.1 What is FTTP?

FTTP is a technology used to supply telecommunications services to the home or office via a single optical fibre instead of copper twisted-pair cable or coaxial cable. The optical fibre cable that Telstra uses for this purpose is similar in physical size to a conventional telephone cable but contains no metallic components. Also, only one such cable is necessary to supply telephone, broadband data (internet) and TV services, instead of two or more separate cables.

There are various types of FTTP that may be used but the type used by Telstra is GPON (Gigabit Passive Optical Network) which, as the name suggests, may ultimately be used to supply up to one Gigabit per second (1 Gbps) of data per connected optical fibre at the customer's premises.

#### 3.2 What services does Telstra FTTP provide?

Telstra FTTP can supply the following services to the home over a single optical fibre:

- up to two (2) telephone services;
- a high-speed internet ("data") service;
- digital free-to-air (FTA) TV (in supported areas); and
- pay TV (FOXTEL\*) (in supported areas).

Notes:

1. Each telephone service will support narrowband dial-up modems and most dial-up alarm units (e.g. monitored security alarms and emergency call/medical alert systems). Pulse dialling, payphones, 50 Hz customer loop metering, ISDN and dedicated EFTPOS are not supported by Telstra FTTP.
2. The data service is Ethernet. While it may be accessed without a modem, the use of a gateway device or router is recommended to:
  - provide a hardware firewall between the customer's PC and the internet;
  - avoid the need to install any client software on the customer's PC;
  - simplify remote diagnostics of the data service; and
  - support wired and wireless connection of multiple PCs or Ethernet devices to the data service.
3. The digital FTA TV and pay TV services provided by Telstra FTTP may avoid the need for an external TV antenna or satellite dish.

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### 3.3 FTTP equipment

#### 3.3.1 General

Certain equipment must be installed in the home to enable the supply of services via FTTP. This equipment is required even if the customer only wants a basic telephone service. The equipment is described below and is illustrated in Figure 1 to Figure 4. Telstra supplies and installs the optical fibre cabling and the FTTP equipment. The builder or customer provides a power point as described in 3.3.5.

#### 3.3.2 Network Termination Device (NTD) and Power Supply Unit (PSU)

The optical fibre lead-in cable from the Telstra network terminates within a device that converts the optical (light) signals into electrical signals for connection of services to conventional copper cables and customer equipment. This device is called an Optical Network Terminal (ONT) and is designated as a **Network Termination Device (NTD)**. The device is referred to as an NTD throughout this Document.

A **Power Supply Unit (PSU)** is required to provide power for the NTD. This requires a **dedicated power point** into which the PSU is plugged.

Note: While power for operating a telephone service has traditionally been supplied via the copper telephone line from the telephone exchange, optical fibre does not conduct electricity and continuous power needs to be supplied at the home to operate the electronic equipment even if the customer only requires a basic telephone service.

Two types of PSU are available:

- a small “plug pack” that plugs straight into the power point; or
- a larger unit that may house an optional, rechargeable, **backup battery** to maintain operation of a “lifeline” telephone service, if required, during a blackout (the customer must usually supply and maintain the backup battery).

The NTD and the PSU must be installed in a suitable location **inside** the building. They are **not suitable for external (outdoor) installation** whether or not they are contained in a weather-resistant enclosure.

#### 3.3.3 Premises Connection Device (PCD)

A **Premises Connection Device (PCD)** is normally installed on the external wall of the building to:

- connect (“splice”) the external optical fibre lead-in cabling to the internal optical fibre lead-in cabling
- store excess optical fibre cable where pre-terminated cables are used (especially where there is no suitable building cavity for storing the excess cable)
- provide a readily accessible point for testing, repair or replacement (by Telstra) of either the internal or the external optical fibre cabling.

The PCD does not require power.

#### 3.3.4 Fibre Wall Outlet (FWO)

A **Fibre Wall Outlet (FWO)** may be used in some cases to connect the internal optical fibre lead-in cabling to the NTD fly lead. The FWO facilitates easy replacement of a faulty NTD or connecting cord without disturbing the fixed/concealed internal optical fibre cabling

#### 3.3.5 Power point

A **dedicated, double-socket power point** is required **within 1 m of the NTD** to power the NTD (via the PSU) and also to power a “gateway” device through which the FTTP services may be supplied.

The power point does not require its own final subcircuit but it must be dedicated to powering of the FTTP equipment. The power point is to be left switched on at all times.

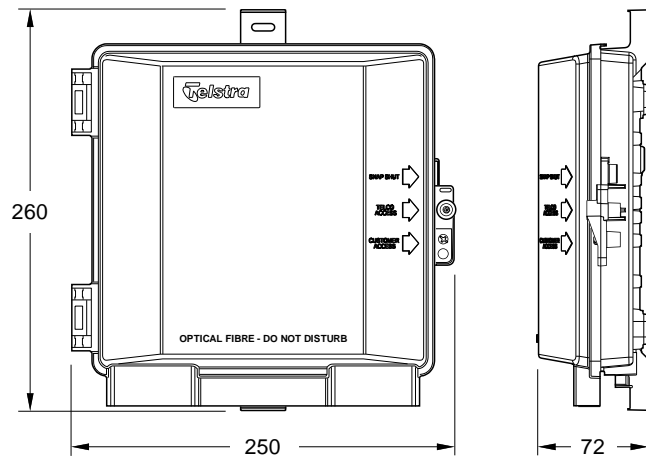
The builder or customer is required to provide the power point.

**Figure 1 Telstra Premises Connection Device (PCD)**

Photograph



Dimensions



**Figure 2 Indoor Telstra FTTP NTD (Alcatel-Lucent Model I-241G-B)**

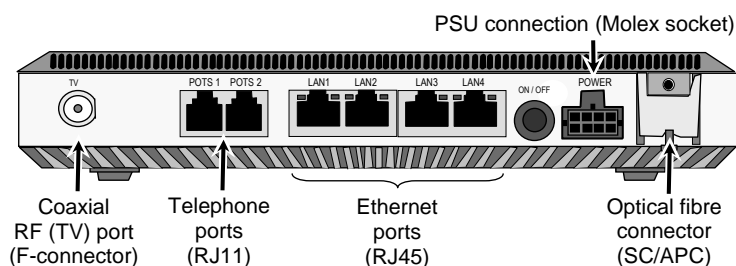
(a) Wall-mounted



(b) Shelf-mounted



**(c) Service ports and connections on the rear of the NTD**



Notes:

1. This NTD is used by Telstra for apartments and will be used for all new Telstra FTTP installations from late 2013.
2. The NTD is designed for indoor installation and is not to be installed outdoors.
3. The dimensions of this NTD are 208 mm x 150 mm x 35 mm excluding the wall mounting bracket and fly leads.
4. The NTD may be mounted vertically, as shown above, to provide easy access to the service ports or may be mounted horizontally if required. If the NTD is shelf-mounted, it will be connected via a flexible cord to a fixed Fibre Wall Outlet (FWO) to which the internal lead-in cabling from the external PCD is connected (see Figure 3).
5. Only the first Ethernet port (LAN1) is used by Telstra.



**Figure 3 A typical Fibre Wall Outlet (FWO)**



**Notes:**

1. Telstra only uses a Fibre Wall Outlet (FWO) where the NTD is shelf-mounted. The FWO is used to connect the fixed internal optical fibre lead-in cabling to the optical fibre fly lead used to connect the NTD. If the NTD is wall-mounted, the fixed cabling is connected to the fly lead in the wall bracket, which includes a fibre storage tray, behind the NTD.
2. The FWO pictured at left is 160 mm high by 102 mm wide (not including the fly lead). It is normally installed vertically with the fly lead at the bottom as shown but may also be mounted horizontally if necessary.

**Figure 4 Typical PSUs for an indoor Telstra FTTP NTD**

**(a) Standard PSU ("plug pack")**



**(b) PSU with optional battery backup**



**Notes:**

1. The standard PSU plugs directly into the power point and has a 1300 mm cord which is the limiting factor for the 1 m maximum distance between the PSU and the NTD.
2. The PSU with the optional battery backup is 185 mm high, 85 mm deep and 115 mm wide excluding cords (205 mm wide allowing for cords and battery access). It may be wall-mounted or shelf-mounted:
  - A PSU with battery backup should be used if a monitored ("back-to-base") security alarm system or a personal response (emergency call/medical alert) system is to be installed. Telstra does not normally supply or maintain the backup battery.
  - Powered customer equipment such as cordless telephones and VOIP equipment will not operate during power failure unless they too have battery backup.
  - Information about suitable batteries is provided in Telstra Document No. 017153a00, *Cabling of premises for telecommunications — A complete guide to home cabling*.

## Information for builders and cabling providers

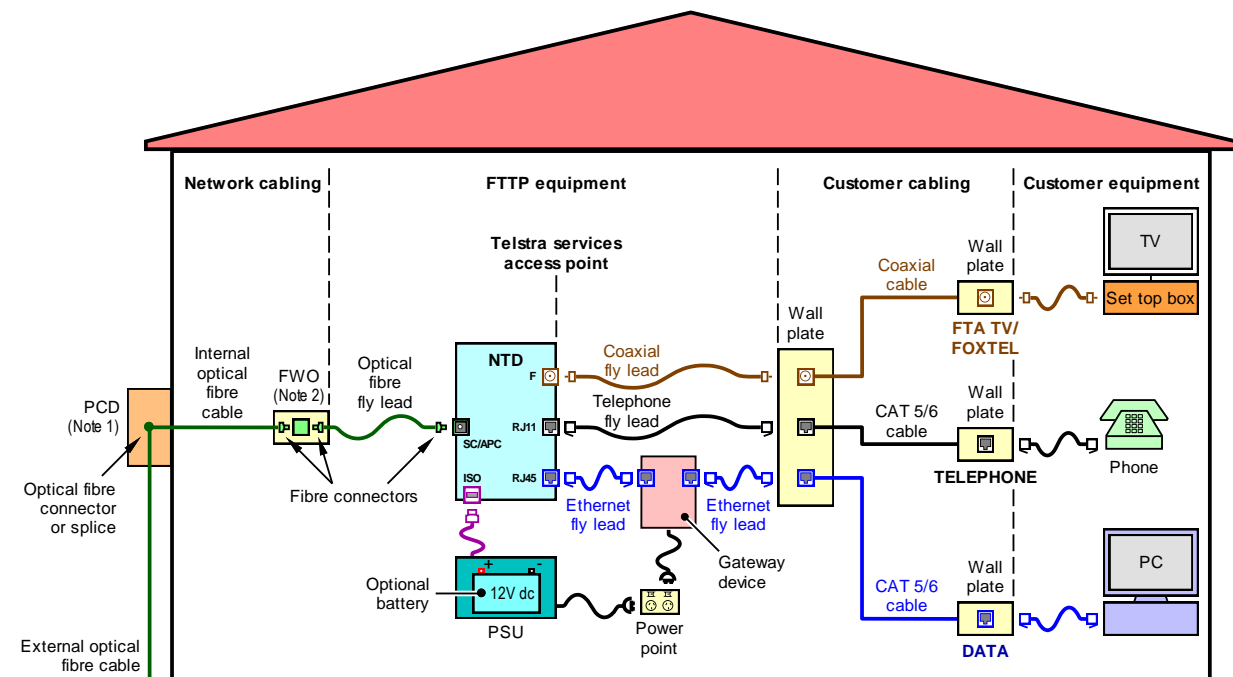
### 3.3.6 Telstra FTTP equipment connection arrangements

The connection arrangements for the Telstra FTTP equipment are illustrated in Figure 5.

The NTD is connected to the optical fibre cable, power supply cable and service cabling (customer cabling) via plugs, sockets and cords ("fly leads"), which are connected to the rear of the NTD. Connections are made to the fixed/concealed customer cabling via a multi-socket wall plate (or a patch panel if home networking is installed).

Refer to section 5 for more information.

**Figure 5 Telstra FTTP equipment connection arrangements in a home**



#### Notes:

1. An external Premises Connection Device (PCD) is used to:
  - support a change of cable type at the building entry point
  - store excess external and internal optical fibre cable where pre-terminated cables are used (especially where there is no suitable building cavity for storing the excess cable)
  - provide a readily accessible point for testing, repair or replacement (by Telstra) of either the internal or the external optical fibre cable.
2. A Fibre Wall Outlet (FWO) is used to facilitate easy replacement of a faulty NTD or optical fibre fly lead without disturbing the fixed/concealed internal optical fibre cabling. An NTD wall mounting bracket that includes a fibre storage tray may be used instead of an FWO for housing the fibre connectors that connect the internal optical fibre cable to the optical fibre fly lead.



## 4 LOCATION OF THE FTTP EQUIPMENT

### 4.1 General

All FTTP equipment needs to be readily accessible, i.e. capable of being reached easily and without climbing over or removing obstructions, mounting upon a chair, or using a moveable ladder. It is particularly important for optical fibre equipment to be accessible at ground/floor level because optical fibre splicing and testing equipment is bulky and is not generally safe or suitable to use on a ladder.

Guidelines for location of the external Premises Connection Device (PCD) are provided in Telstra Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes*.

General guidance for the location of indoor electronic (powered) equipment is provided in Telstra Document No. 017153a00. Specific guidance for locating a Telstra FTTP NTD and associated PSU is provided in 4.2 below. The FTTP NTD and PSU are Telstra-owned network equipment which **must** be located in accordance with 4.2. Telstra may refuse to install its equipment in a location that is unsuitable.

For a summary of suitable and unsuitable locations for the NTD and PSU, refer to Table 1.

### 4.2 NTD and PSU location factors

#### 4.2.1 Heat

The NTD and PSU generate heat that must be dissipated to prevent overheating that may lead to equipment failure or damage to the customer's property. Adequate clearance must be maintained around the equipment to ensure adequate ventilation. The equipment must **not** be installed behind clothes in a robe, inside a linen closet or behind a window curtain (see 4.2.2).

The NTD and PSU must **not** be exposed to external heat sources that may raise the ambient temperature to the extent that normal equipment ventilation will be inadequate to prevent overheating. For example, the equipment must not be installed near a heating appliance or heating vent, be exposed to direct sunlight (e.g. through a window) or be installed in an enclosure that is exposed to direct sunlight.

#### 4.2.2 Lint and dust

The equipment must be installed in a lint-free environment to avoid a build-up of particles that may impede the circulation of air around the internal components. Dusty environments must also be avoided.

The equipment must not be located behind any curtains. Curtains may shed lint or other fabric particles onto the equipment. Rain is also a concern under windows (see 4.2.3). Curtains may also reduce normal ventilation of the equipment (see 4.2.1).

#### 4.2.3 Moisture

The equipment must not be located in any area of the home that may be moist from time to time, such as a bathroom or laundry. While a domestic toilet (WC) is not usually a moist environment, the location of the equipment in a toilet is not permitted due to limited space and access restrictions (obstacles).

The equipment must not be located under a window where it could be accidentally exposed to rain ingress. The equipment must not be permanently exposed to open air (e.g. in an open patio, veranda or car port) or within an external enclosure that is exposed to open air (heat is also a concern in such cases — refer to 4.2.1).

#### 4.2.4 Electromagnetic interference (EMI)

Certain appliances in the home may have the propensity to interfere with the proper functioning of the FTTP equipment due to electromagnetic radiation (e.g. caused by power switching transients). Some possible sources of interference are airconditioning units, refrigerators/freezers, ducted vacuum system motors, fluorescent lamps, electric ovens/cooktops, electrical switchboards, etc.

The FTTP equipment should not be located within 1 m of any electrical equipment similar to those described above, which may be a source of EMI.



### Information for builders and cabling providers

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#### 4.2.5 Access

##### 4.2.5.1 General

The customer will be required to access the NTD and PSU regularly to monitor the visual indicators and may also be required to test the services at the NTD service ports from time to time. Therefore, the NTD and PSU must be readily accessible by the customer, i.e. the customer should not be required to stand on a stool or a chair or lay on the floor to check the visible indicators or access the NTD service ports.

At least 900 mm x 900 mm clear floor space should be available in front of the equipment for access purposes. Furniture or other objects that can be safely and easily moved by one person may be placed in front of the equipment.

##### 4.2.5.2 NTD

Sufficient space must be provided to access the NTD ports and to slide the NTD off the wall-mounting bracket (where the NTD is wall-mounted).

Where the NTD is wall-mounted in a cupboard/closet/cabinet or beside a solid object (e.g. in a corner), at least 90 mm clearance is required for connection of fly leads to the service port side of the NTD and at least 25 mm clearance is required on all other sides of the NTD. Refer to the NTD clearance diagrams in Table 1.

The NTD must be installed no less than 350 mm (measured to the bottom of the NTD) and no more than 1800 mm (measured to the top of the NTD) from floor level.

##### 4.2.5.3 PSU

Where a PSU with battery backup is to be installed, sufficient clearance must be provided to see the status LEDs and their symbols, to slide the PSU off the wall (if applicable) and to access the battery compartment. If the PSU is fixed (i.e. wall-mounted) in the corner of a room or cupboard/closet/cabinet, a minimum clearance of 250 mm must be provided to the left of the PSU so the customer can see the LED symbols. At least 90 mm must be provided to the right of the PSU to fit or replace the battery. Refer to the PSU clearance diagram in Table 1.

The PSU must be installed no more than 1800 mm from floor level (measured to the top of the PSU).

#### 4.2.6 Equipment enclosure

If the FTTP equipment is to be housed in an (indoor) enclosure, refer to Telstra Document No. 017153a01, *Cabling of premises for telecommunications — Essential information for home cabling*, for the enclosure requirements.

The enclosure must be adequately sized and ventilated and should **not** be recessed into the cavity of an external (perimeter) wall. The cavity of an external wall may be damp, which means the inside of the enclosure may be damp, and this may lead to corrosion of the equipment. Heat build-up may also be an issue with external walls exposed to the sun during the summer (see 4.2.1).

Note: The enclosure may be installed on the surface of the internal wall. However, the cable entry holes to the wall cavity should be stopped to minimise the entry of humid air and debris from the cavity to the enclosure.

**Table 1 Guidelines for locating the NTD and PSU**

Location	NTD/PSU position	Relevant concerns
Bar	Away from any sink, refrigerator, dispensing areas	Splashing, heat/electrical interference (refrigerator)
Bathroom	Not permitted	Splashing, condensation, general humidity
Bedroom/Study (see also "Robe")	In a corner, not under windows or behind blinds, curtains or heavy furniture	Physical damage or customer injury (if not protected by a corner), sunlight/water entry (window), access, air circulation (blinds/curtains)
Broom cupboard	Install below shelf above broom handles (subject to height limit)	Physical damage or dislodgement from wall (e.g. broom handles), access, air circulation
Garage	Away from work benches, fixed electric motors (vacuum cleaner, drill) windows, sinks, work areas	Physical damage (work bench), dust/electrical interference (electric motor), splashing (sink), exposure to sunlight or water entry (window)
Hall/Passageway	In a corner, not under windows or behind furniture, blinds or curtains	Physical damage or customer injury (if not protected by a corner), sunlight/water entry (window), access, air circulation (blinds/curtains)
Kitchen/Family room (see also "Pantry")	Above benches only, away from sink, refrigerator, cooking areas and windows	Access, splashing, heat, steam, condensation, electrical interference, sunlight/water entry (open window), air circulation (curtains)
Laundry	Allowable in well ventilated laundries only, away from tubs, clothes drier, washing machine, and windows, etc.	Splashing (tubs), heat/humidity/condensation (clothes drier), electrical interference (washer, drier), exposure to sunlight/water entry (window, external door)
Linen closet	Not permitted	Access, air circulation, dust (lint)
Lounge/Living Room, Rumpus/ Games Room (see also Bar)	In a corner, not under windows or behind blinds, curtains or heavy furniture	Physical damage or customer injury (if not protected by a corner), sunlight and water entry (window), access, air circulation (blinds/curtains)
Pantry (large walk-in style only)	Above or immediately below top shelf only (subject to height limit)	Access, air circulation, food debris, fluids
Pantry cupboard (full height)	Not permitted	Access, air circulation, food debris, fluids
Patio	Not permitted	Security, exposure to sunlight, water, dust, insects
Robe	Above hanger shelf (subject to height limit), not behind clothes	Air circulation, dust (lint)
Roof space	Not permitted	Access, heat, dust, vermin
Sauna or Spa	Not permitted	Humidity, condensation, splashing
Shed (adjoining)	Not permitted	Heat, humidity, dust, physical damage
Shower room	Not permitted	Humidity, condensation, splashing
Toilet	Not permitted	Access (obstacles)
Tool cupboard	Not permitted	Air circulation, physical damage
Under floor	Not permitted	Security, humidity, dust, vermin
Verandah	Not permitted	Security, exposure to sunlight, water, dust, insects
Wall cavity	Not permitted	Access, humidity, vermin



**Minimum clearances for a wall-mounted NTD**



**Minimum clearances for a wall-mounted PSU with battery backup**



## 5 CABLING OF THE HOME TO SUPPORT FTTP

### 5.1 Things have changed

Traditionally, telephone and ADSL access points (outlets) have been wired sequentially from an external wall box or radially from an outdoor NTD. **These cabling methods are unsuitable for new homes** as they will not support modern telecommunications services, especially services supplied via Telstra FTTP or the National Broadband Network (NBN).

In the past, Telstra has used an outdoor FTTP NTD for houses. From late 2013, **Telstra will be using an indoor FTTP NTD**, which is consistent with the FTTP arrangements used with the NBN. The outdoor Telstra FTTP NTD is now regarded as “legacy” equipment and is described in section 6 for maintenance purposes only.

The FTTP equipment connection arrangements for Telstra FTTP are illustrated in **Figure 5** (page 7). The home cabling architecture required to support FTTP is described in 5.2.

### 5.2 Home cabling

The cabling architecture required to support Telstra (and NBN) FTTP is illustrated in **Figure 6**.

The optical fibre cables and equipment are too fragile to be installed during construction and must be installed by the carrier (Telstra) **after the building is completed**. Therefore, the builder is required to install suitable conduit (with pull cord) or trunking during construction to enable the optical fibre cables to be pulled in and the FTTP equipment installed without the need to access roof or underfloor spaces.

### 5.3 Limitations

The Telstra FTTP NTD and PSU must be located in the same building where the services will be used by the end-user. For technical and safety reasons, **the NTD cannot be located at a detached structure** such as a fence or a separate garage.

The Telstra FTTP NTD service ports must **not** be connected to any metallic-conductor cable that runs to another building except as described in section 12 of Telstra Document No. 017153a00.

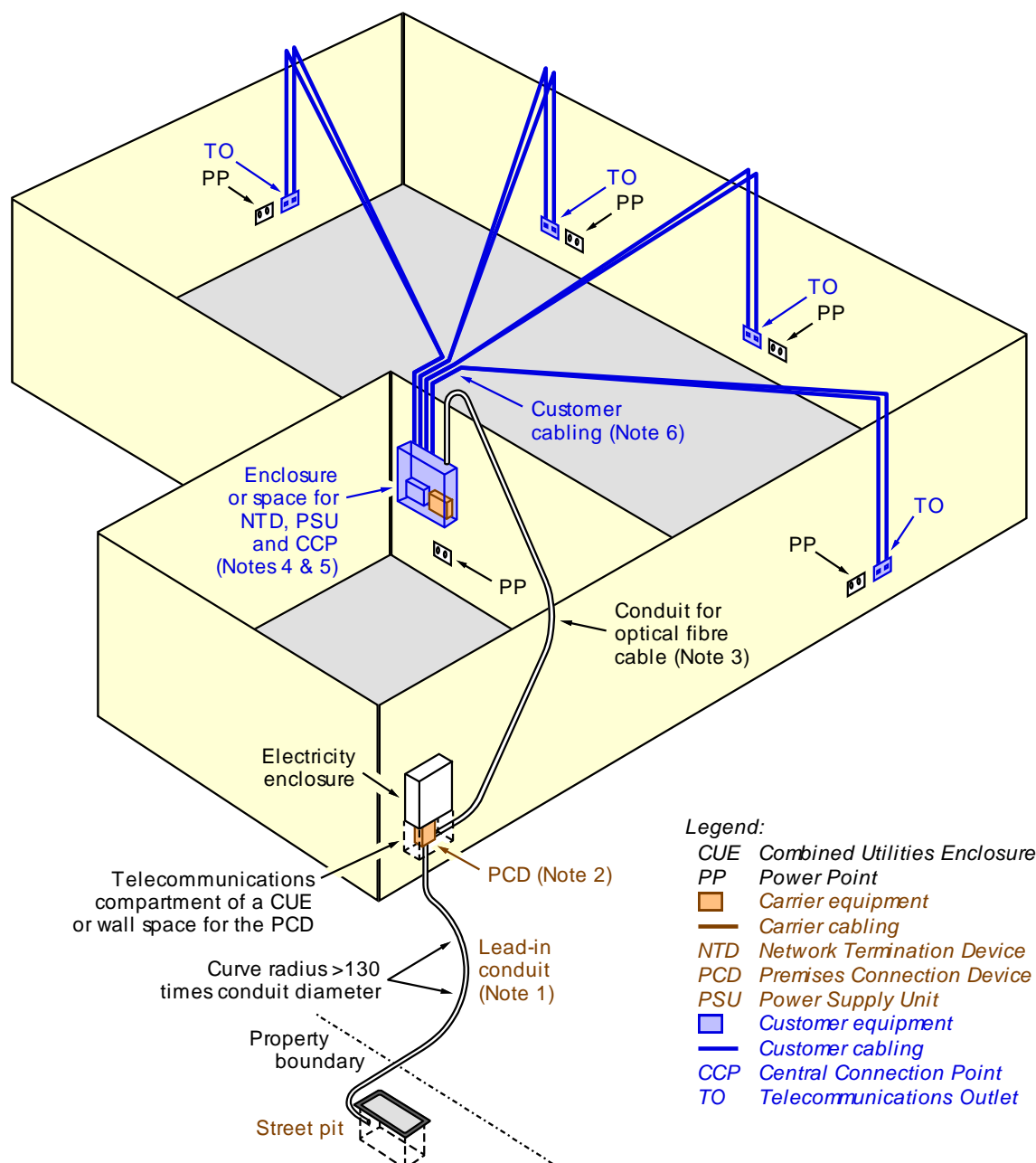
The maximum length of internal cabling that may be connected to a telephone port of the Telstra NTD is 300 metres (e.g. for connection to a lift telephone in multi-storey residential apartments). This assumes the use of cable with 0.50 mm diameter (24 AWG) solid copper conductors.

### 5.4 Further information

For more information about cabling a home for FTTP, refer to the following Telstra guidelines:

- Document No. 017153a00, *Cabling of premises for telecommunications — A complete guide to home cabling* (a comprehensive reference, including tutorials, customer cabling options, CCP wiring, data cable installation practices, coaxial cabling guidelines and backup battery information)
- Document No. 017153a01, *Cabling of premises for telecommunications — Essential information for home cabling* (basic guidance for cabling a new home)
- Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes* (detailed guidance about providing facilities for installation of the cabling between the access pit and the indoor FTTP NTD).

**Figure 6 Home cabling architecture for Telstra (and NBN) FTTP**



**Notes:**

1. Lead-in conduit with a pull cord is required to enable Telstra to install the cable **after the building is completed**.
2. A Premises Connection Device (PCD) is installed on the external wall of the building to connect ("splice") the underground optical fibre lead-in cable to the internal optical fibre lead-in cable.
3. An internal conduit with a pull cord and/or suitable trunking is required to enable Telstra to install the cable to the FTTP NTD **after the building is completed** and without the need to access the roof cavity or underfloor space.
4. An enclosure or suitable space – with at least one adjacent double-socket power point – is required inside the building to accommodate the indoor FTTP NTD and PSU.
5. A Central Connection Point (CCP), e.g. a multi-socket wall plate or a patch panel, is required near the FTTP NTD to connect the FTTP services to the customer cabling.
6. Suitable customer cabling needs to be installed between the CCP and Telecommunications Outlets (TOs) located in the rooms in which the customer will require access to the telecommunications services. The use of **Category 6** cabling (or better) is recommended. For coaxial cabling requirements (where applicable), see 5.5.

## Information for builders and cabling providers

**5.5 Coaxial cabling (where required)**

Some Telstra FTTP networks provide access to digital free-to-air (FTA) TV and/or FOXTEL via a single radio frequency (RF) port on the NTD. This is provided in some developments to avoid the need for external TV antennas and satellite dishes.

Coaxial cabling guidelines are provided in Telstra Document No. 017153a00 and may be applied to coaxial cabling connected to a Telstra FTTP NTD. For calculation of losses for the purpose of designing the coaxial cabling system as described in Document No. 017153a00, the expected RF signal levels at the F-connector of the FTTP NTD are provided in Table 2.

**Table 2 Expected RF power levels at the F-connector of the NTD**

Operating bandwidth	Signal level	BER	MER
85 MHz to 862 MHz	72 dBμV (minimum) 83 dBμV (maximum)	$> 1 \times 10^{-8}$	$\geq 32$ dB

Note: All RF signal levels are digital channel power levels measured in an 8 MHz bandwidth.

Generally up to four coaxial sockets may be cabled from the NTD (via a 4-way splitter) without the need for an RF amplifier. The total length of cable between the NTD and any wall plate may be up to at least 40 metres, assuming the minimum NTD signal level of 72 dBμV, the use of RG6 quadshield cable with a loss of less than 0.18 dB per metre, total F-connector losses of 1.6 dB, a 4-way splitter loss of 8 dB and the minimum recommended RF power level at the wall plate of 55 dBμV. Longer cabling distances or additional sockets may be possible if the signal level from the NTD is higher than 72 dBμV (the RF signal level depends on the optical power level at the NTD).

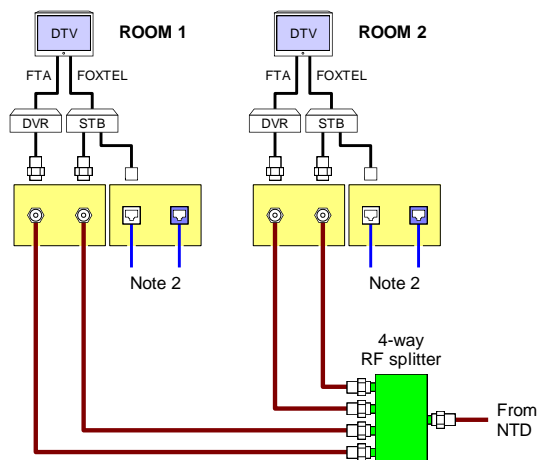
Refer to Telstra Document No. 017153a00 for more information about calculating coaxial cabling system losses and balancing the system to avoid inadequate or excessive signal levels at the wall plates.

Where both FTA TV and FOXTEL are supplied from the NTD, two coaxial cables must be run to two coaxial sockets on each wall plate — one for connection of FTA TV and one for connection of the FOXTEL set top box. This means the signal from the NTD must be split four ways by means of one of the arrangements shown in Figure 7. Alternatively, two cables may be run to a dual-socket wall plate for connection of FTA TV and a single FOXTEL set top box and two cables may be run to separate, single-socket wall plates for connection of FTA TV as shown in Figure 8 (a). Where only FTA TV is supplied from the NTD, the four coaxial cables may be run to four separate, single-socket wall plates for connection of four TV receivers as illustrated in Figure 8 (b).

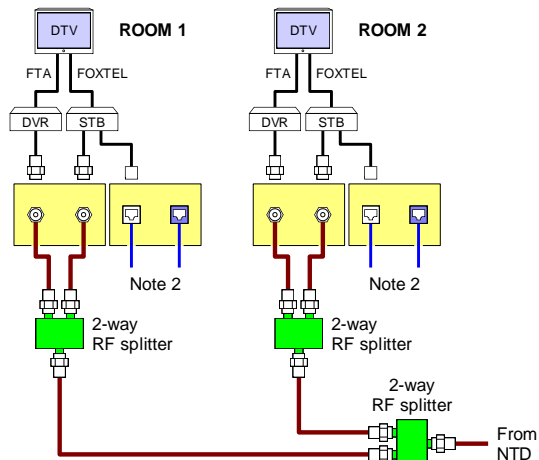


**Figure 7 Cabling of dual-socket outlets for FTA TV and FOXTEL connections**

**(a) Recommended cabling arrangement**



**(b) Alternative cabling arrangement**



**LEGEND:**

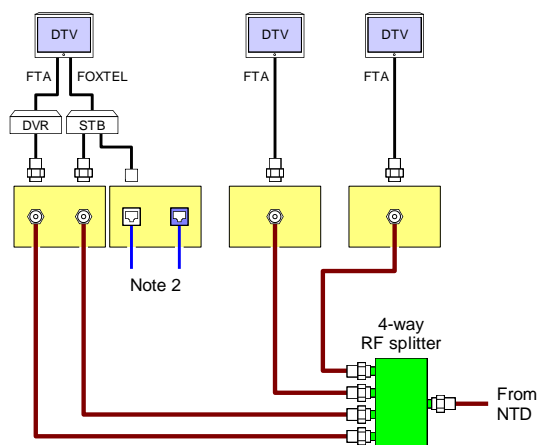
	Modular socket	DTV	Digital Television	NTD	Network Termination Device
	Modular plug	DVR	Digital Video Recorder	RF	Radio Frequency
	F-connector socket	FTA	Free To Air	STB	Set Top Box
	F-connector plug				

**Notes:**

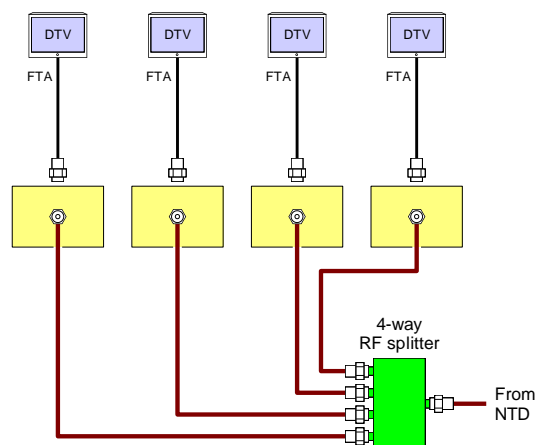
1. The installation of more than four coaxial sockets will normally necessitate the installation of an RF amplifier.
2. Where home networking is installed, at least two data sockets should be cabled to each TV point, as indicated above, for IPTV, online gaming, etc. Refer to Telstra Document No. 017153a00 for more information.

**Figure 8 Other cabling options for FTA TV and FOXTEL connections**

**(a) One point only for FTA TV and FOXTEL**



**(b) FTA TV only**



**LEGEND:**

	Modular socket	DTV	Digital Television	NTD	Network Termination Device
	Modular plug	DVR	Digital Video Recorder	RF	Radio Frequency
	F-connector socket	FTA	Free To Air	STB	Set Top Box
	F-connector plug				

**Notes:**

1. The installation of more than four coaxial sockets will normally necessitate the installation of an RF amplifier.
2. Where home networking is installed, at least two data sockets should be cabled to each TV point for IPTV, online gaming, etc. Refer to Telstra Document No. 017153a00 for more information.

### 6 OBSOLETE FTTP EQUIPMENT

#### 6.1 Outdoor NTD

##### 6.1.1 Description

From late 2013, Telstra will cease installing outdoor FTTP NTDs for homes and will use indoor NTDs for all new installations. The outdoor FTTP NTDs will then become obsolete.

The outdoor NTD is described below for maintenance purposes.

Where an outdoor NTD is faulty and needs to be replaced, it will be replaced with another outdoor NTD unless stocks of the NTD are depleted, in which case it will be replaced by an indoor NTD. This may be disruptive for the customer, so it is strongly recommended that new homes be prepared in accordance with section 5 such that the cabling is easily adaptable to the use of either outdoor or indoor NTDs.

The outdoor FTTP NTD and associated PSU are pictured in Figure 9 and Figure 10.

**Figure 9 Outdoor Telstra FTTP NTD (obsolete)**

**NTD within a combined enclosure with the electricity**



**Standalone NTD**



**Figure 10 Telstra FTTP PSU with optional battery backup (obsolete type)**

**Typical PSU**



**Optional 12 V backup battery**



#### Notes:

1. The PSU is installed inside the building and is connected to the outdoor NTD by a special, multi-core power cable. The PSU cannot be located outdoors.
2. For information about the optional backup battery, refer to Telstra Document No. 017153a00.

## Information for builders and cabling providers

### 6.1.2 Connecting customer cabling at the NTD

The outdoor NTD contains the following service ports:

- 4 telephone lines
- 1 Ethernet port for broadband data
- 1 coaxial port for FTA TV or FOXTEL.

Only one cable may be connected to the NTD for each of the above service categories, as follows:

- a 4-pair Category 5 or Category 6 cable for the four telephone lines
- a 4-pair Category 5 or Category 6 cable for the broadband data service
- an RG6 coaxial cable for the FTA TV/FOXTEL connection.

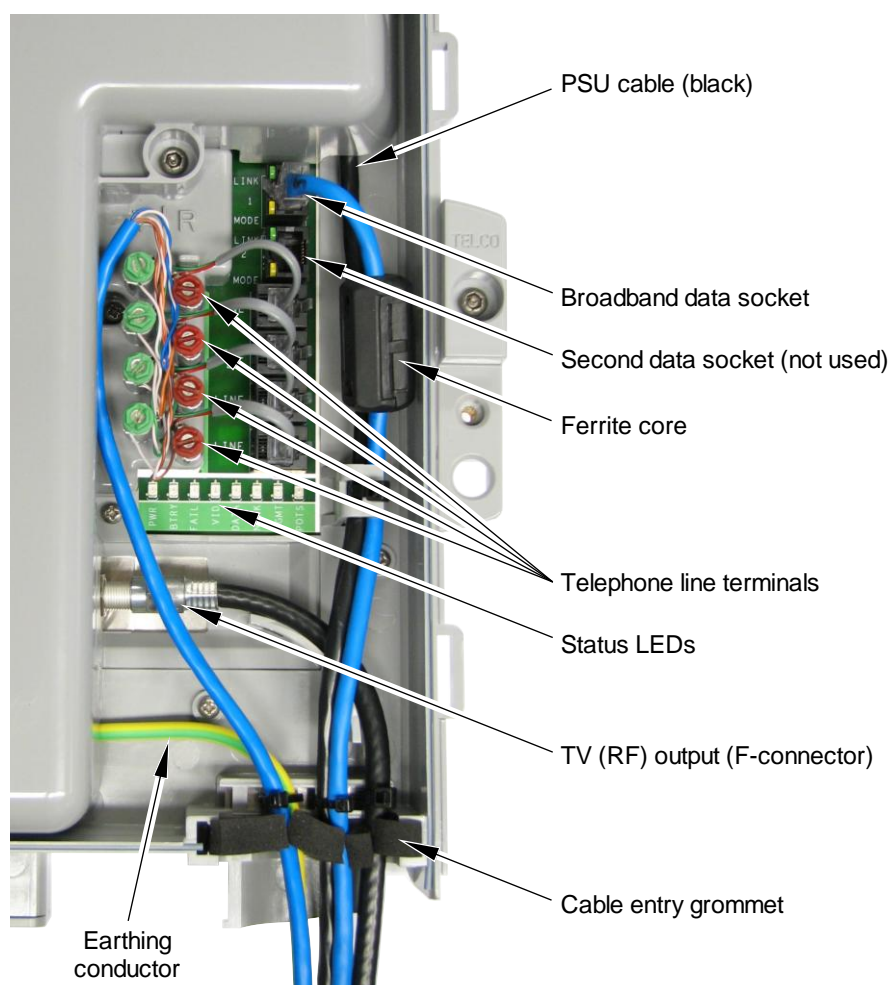
Any additional cables (e.g. for additional telephone points) must be connected via an internal distribution device or some other method.

Cabling providers may gain access to the NTD connections via the cover securing screw designated "CUSTOMER ACCESS", using a standard flat-blade or No.2 Phillips-head screwdriver.

Note: Despite the marking, for technical and safety reasons customers are **not** authorised to access the NTD.

The customer cable connections at the NTD are shown in Figure 11.

**Figure 11 Outdoor FTTP NTD connections**



Note: Cable connection details are provided in 6.1.4, 6.1.5 and 6.1.6.



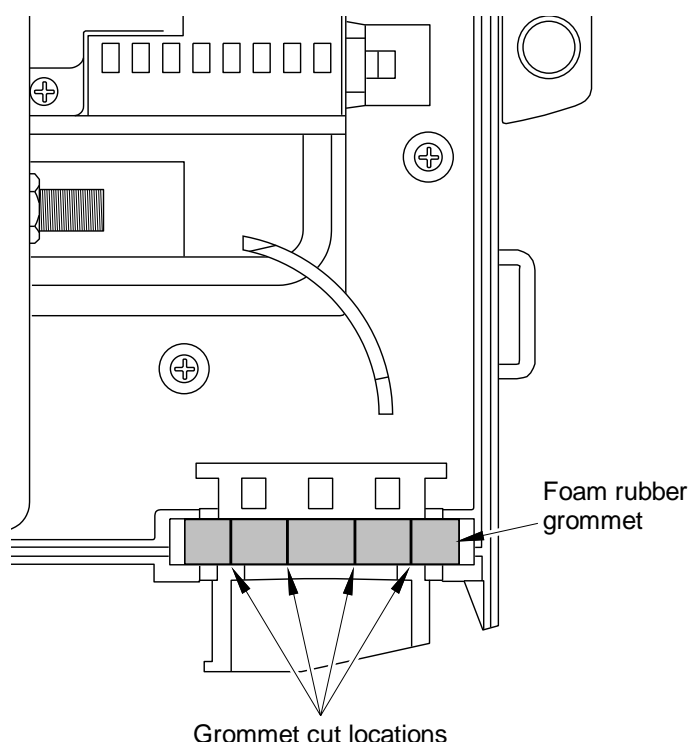
## Information for builders and cabling providers

### 6.1.3 Cable entry

The NTD has grommets in the cable entry ports to keep insects out and to prevent the ingress of water due to splashing or spraying (e.g. washing, hosing). The grommets are made of foam rubber and are provided in two sections — one in the base and one in the lid. It is important to cut the grommet in the base where the cables enter to ensure that the grommets seal the cable entry properly. It is equally important **not** to cut the grommet in the lid.

Using diagonal cutters, cut the cable entry grommet at each cable location (see Figure 12) and lay the cables in the cuts. Tie the cables to the cable tie supports as shown in Figure 11. **Do not overtighten the cable ties.**

**Figure 12 Cutting the cable entry grommet**



**Notes:**

1. Only cut the grommet where a cable or cables will lay. Up to four cuts may be made depending on the number of cables entering the cable port.
2. Use diagonal cutters to cut the grommet.

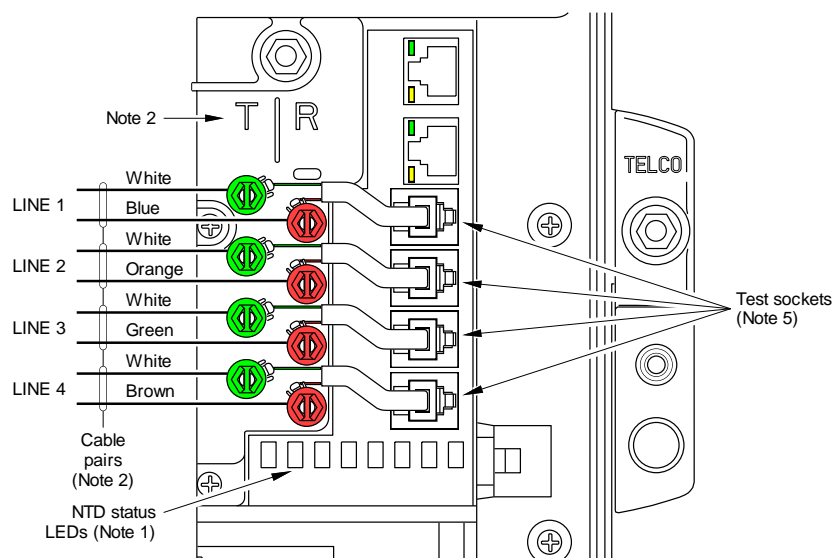
### 6.1.4 Telephone service connections

Connect a 4-pair cable for the telephone services to the telephone line terminals in accordance with Figure 13. Connect pairs 1 to 4 to the terminals for lines 1 to 4 respectively (line 1 is at the top and line 4 at the bottom). Refer to Table 3 (page 19) for the colour code for 4-pair cables. The coloured mate connects to the red terminal (R) and the white mate connects to the green terminal (T).

**CAUTION:** Use a large flat-blade screwdriver (7 mm blade) on the NTD screw terminals (see Figure 13). Using a smaller screwdriver carries a high risk of personal injury or damage to the NTD status LEDs, as a smaller screwdriver will tend slip off the screw while exerting enough pressure on it to turn it.

**Figure 13 Termination of telephone cables within the outdoor FTTP NTD**

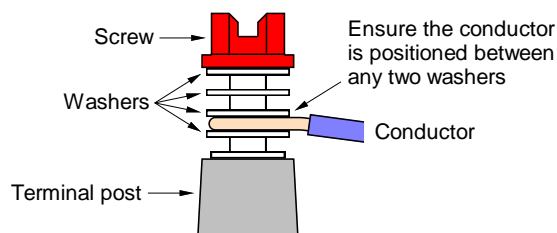
**(a) Telephone cable connections**



**(b) Use a large (7 mm blade) screwdriver (Note 1)**



**(c) Terminating the conductor**



**Notes:**

1. Use a large (7 mm blade) screwdriver on these terminals to minimise the risk of the screwdriver sliding out of the slot and causing personal injury or damaging the NTD status LEDs.
2. Each line has a green and red screw terminal, designated "T" ("Tip") and "R" ("Ring"). T is the L+ or "A" leg while R is the L- or "B" leg. Connect the white mate of each pair to the green terminal and the colour to the red terminal as shown in (a). See Table 3 for the colour code for 4-pair cables.
3. Strip the cable sheath at the top of the terminals as shown in (b). Cut all conductors to a length of about 150 mm, strip the conductor insulation about 30 mm beyond the terminal it is to be connected to, then wrap the bare conductor clockwise around the screw between any two washers as shown in (c). Tighten the screw and break off or snip off the excess conductor. Leave a half loop in the slack conductor as shown in (b).
4. No more than one conductor should be terminated on any screw terminal post. Additional cables should be connected via an internal distribution device or some other method.
5. The test sockets are 6P modular ("RJ11") sockets. These may be used by a cabling provider to test the lines at the NTD using a buttinski or a standard telephone that has a line cord with a 6P modular ("RJ11") plug. For technical and safety reasons, customers are not authorised to access the NTD for any purpose.



## Information for builders and cabling providers

### 6.1.5 Broadband data service connections

The cable for the broadband data service must be connected via an 8P8C plug to the Ethernet socket in the NTD (see Figure 14). The plug must be connected to the Category 5/Category 6 cable on site using a modular plug crimping tool in accordance with Figure 15 to Figure 19. Terminate the plug to standard T568A (refer to Table 3 and Figure 17).

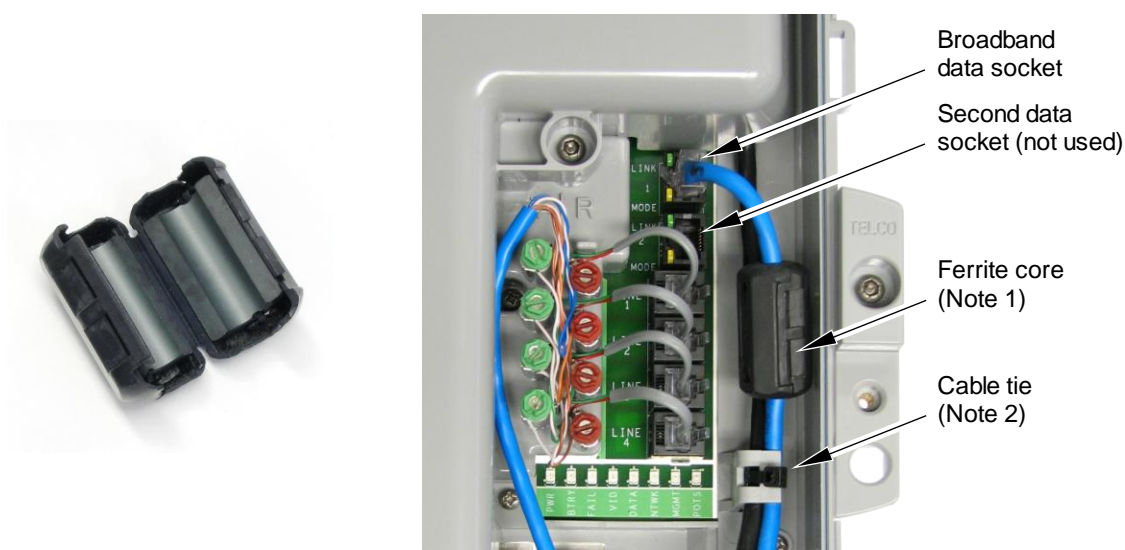
The 8P8C plug used must be a type designed to crimp to cables with **solid** (not stranded) conductors.

Test the cable end-to-end using a suitable continuity tester (see Figure 20).

**Figure 14 Broadband data cable connection to the outdoor FTTP NTD**

(a) Ferrite core supplied with the NTD

(c) Fitting the ferrite core



Notes:

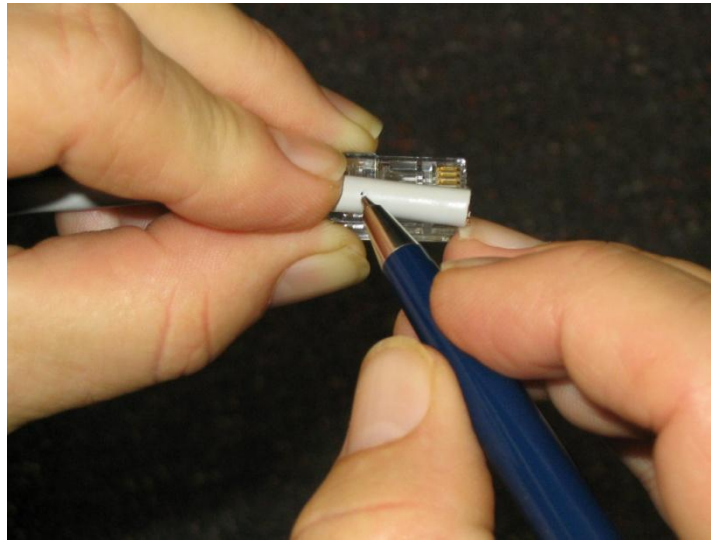
1. A ferrite core is stored in the NTD for fitting by the installer of the customer cabling. Clip the ferrite core around the broadband data cable as close as possible to the socket.
2. Tie the cable *lightly* to the cable tie support, as shown above, to prevent the ferrite core slipping down to the bottom of the NTD.
3. Connect the data cable to the 8P8C plug in accordance with the T568A colour code (see Table 3 and Figure 17).

**Table 3**  
**4-pair cable colour code variations and corresponding socket connections**  
**(TIA/EIA wiring standard T568A)**

Contact no.	Pair no.	4-pair cable colour code variations		
5 4	1	White Blue	White-blue Blue	White-blue* Blue-white*
3 6	2	White Orange	White-orange Orange	White-orange* Orange-white*
1 2	3	White Green	White-green Green	White-green* Green-white*
7 8	4	White Brown	White-brown Brown	White-brown* Brown-white*

\* The first-named colour is the predominant colour.

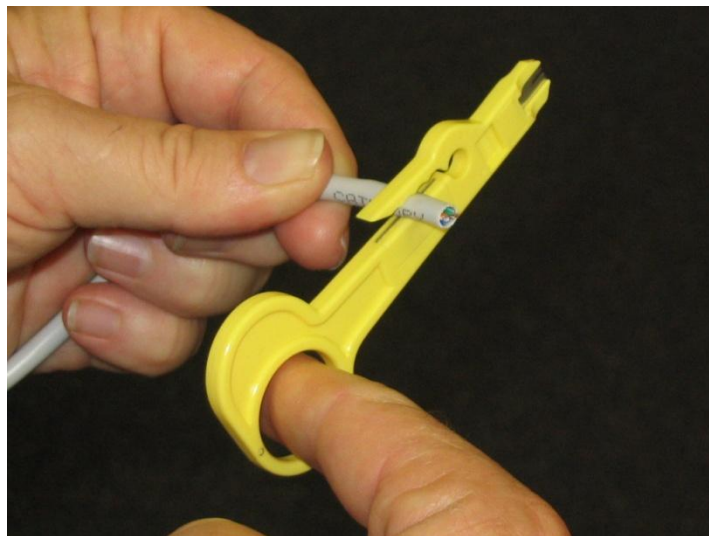
**Figure 15 Connection of 8P8C modular plug — marking the cable sheath**



Notes:

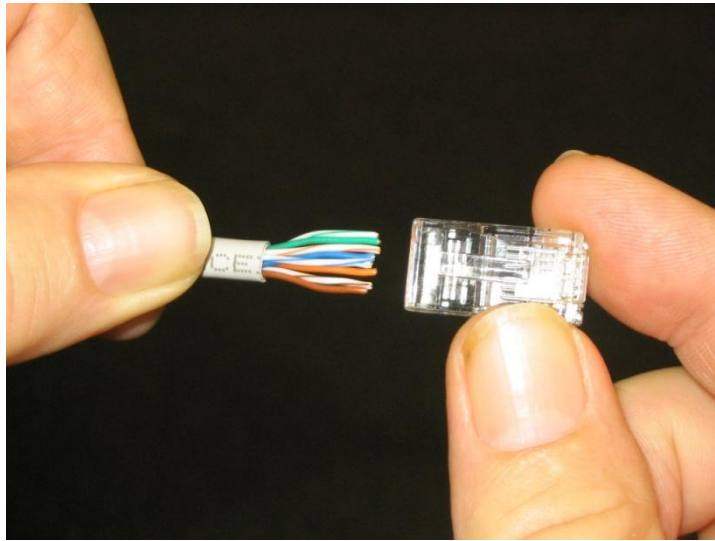
1. Cut the end of the cable neatly and squarely using diagonal cutters.
2. Mark the cable sheath against the depression in the 8P8C plug.

**Figure 16 Connection of 8P8C modular plug — stripping the cable sheath**



Note: Using a suitable cable sheath cutting tool, cut the cable sheath at the mark you made and remove the piece of sheath.

**Figure 17 Connection of 8P8C modular plug — preparation and insertion of the conductors**



Notes:

1. Untwist, fan out and line up the conductors ready for insertion into the plug, in accordance with the T568A colour code (see Table 3).
2. Insert the conductors into the plug, ensuring that they feed correctly into the correct slots.
3. Push the conductors firmly into the plug and ensure that they extend all the way to the end of the plug.

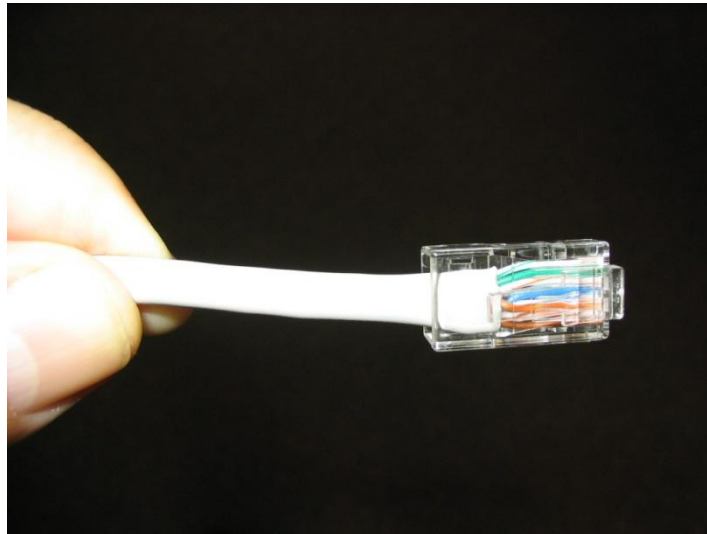
**Figure 18 Connection of 8P8C modular plug — crimping the plug**



Notes:

1. Double-check the colour coding of the plug conductors and that the conductors are properly located in the plug.
2. Seat the plug in the 8P receptacle of the crimping tool, support the cable at right angles to the tool, and crimp the plug.

**Figure 19 Connection of 8P8C modular plug — visual inspection**



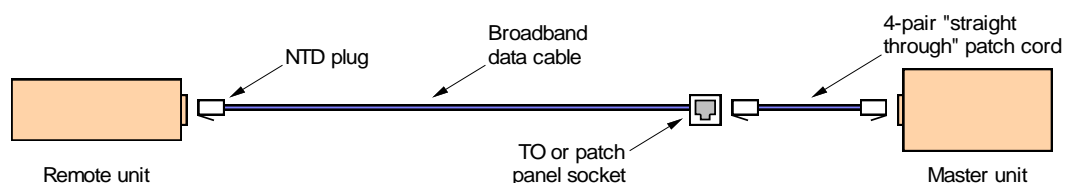
Note: Visually inspect the plug to ensure the contacts are recessed in the plug, the cable sheath is properly restrained, and that the conductors appear to be properly seated within the plug.

**Figure 20 Testing of the broadband data cable**

**(a) A typical 4-pair cable continuity tester**



**(b) Test arrangement for the broadband data cable between the NTD and the indoor socket**



Note: The tester should test for correct wire mapping (pair allocation), split pairs, short circuits, open circuits and reversals.



## Information for builders and cabling providers

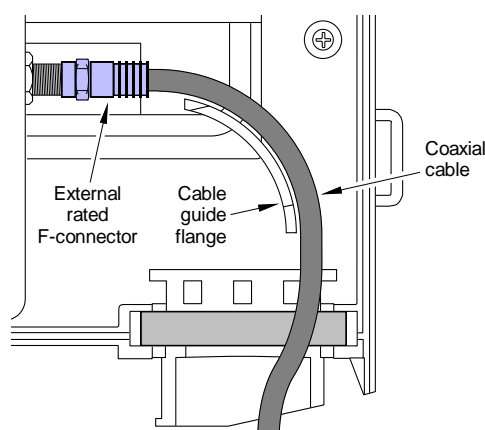
## 6.1.6 Coaxial cable connection for FTA TV/FOXTEL

Connect the coaxial cable to the TV port (female F-connector) on the NTD using an external-rated male F-connector, as shown in Figure 21. For guidance on fitting F-connectors to coaxial cable, refer to Telstra Document No. 017153a00.

It is not possible to leave any slack coaxial cable in the NTD. However, leave sufficient free play in the cable to allow the F-connector to be connected and disconnected without exerting strain on the cable.

**CAUTION:** Once TV appliances are connected to the coaxial cabling, an electrical hazard may be present on the coaxial cable due to leakage currents or a faulty appliance. Follow proper electrical safety precautions when connecting the F-connector to the RF port of the NTD.

**Figure 21 Coaxial cable connection in the outdoor FTTP NTD**



## Notes:

1. Run the cable to the right of the cable guide flange to ensure that the required minimum cable bend radius is maintained and that there is sufficient free play in the cable to disconnect and reconnect the F-connector.
2. Use an external-rated female F-connector. Tighten the F-connector on the threaded TV output port using a torque wrench set to 20-30 inch lbs.
3. The barrel of the F-connector of the NTD is earthed via the earthing conductor described in 6.1.7.

Coaxial cabling guidelines are provided in Telstra Document No. 017153a00 and may be applied to coaxial cabling connected to a Telstra FTTP NTD. For calculation of losses for the purpose of designing the coaxial cabling system as described in Document No. 017153a00, the expected RF signal levels at the F-connector of the outdoor FTTP NTD are provided in Table 4.

**Table 4 Expected RF power levels at the F-connector of the outdoor NTD**

Operating bandwidth	Signal level	BER	MER
85 MHz to 750 MHz	63 dBμV (minimum) 80 dBμV (maximum)	$> 1 \times 10^{-8}$	$\geq 32$ dB

Note: All RF signal levels are digital channel power levels measured in an 8 MHz bandwidth.

Assuming the minimum signal level of 63 dBμV and without using an RF amplifier, 3 coaxial sockets may be cabled up to 25 m from the NTD (via a 3-way splitter) or 2 coaxial sockets may be cabled up to 40 m from the NTD (via a 2-way splitter). Longer cabling distances or more sockets may be possible if the signal level from the NTD is higher (the RF signal level depends on the optical power level at the NTD).

## 6.1.7 PSU cable and earthing conductor

The PSU cable enters the right-hand cable entry port and passes under the broadband internet cable on the right side of the NTD into the top of the Telstra ("Telco") compartment. This is a black cable and can be seen in Figure 11.

The earthing conductor can enter either the right-hand or left-hand cable port, whichever is more convenient. This cable is connected at the bottom of the Telstra ("Telco") compartment.

The PSU cable and the earthing conductor are connected by Telstra.



## Information for builders and cabling providers

### 6.2 Obsolete indoor NTD

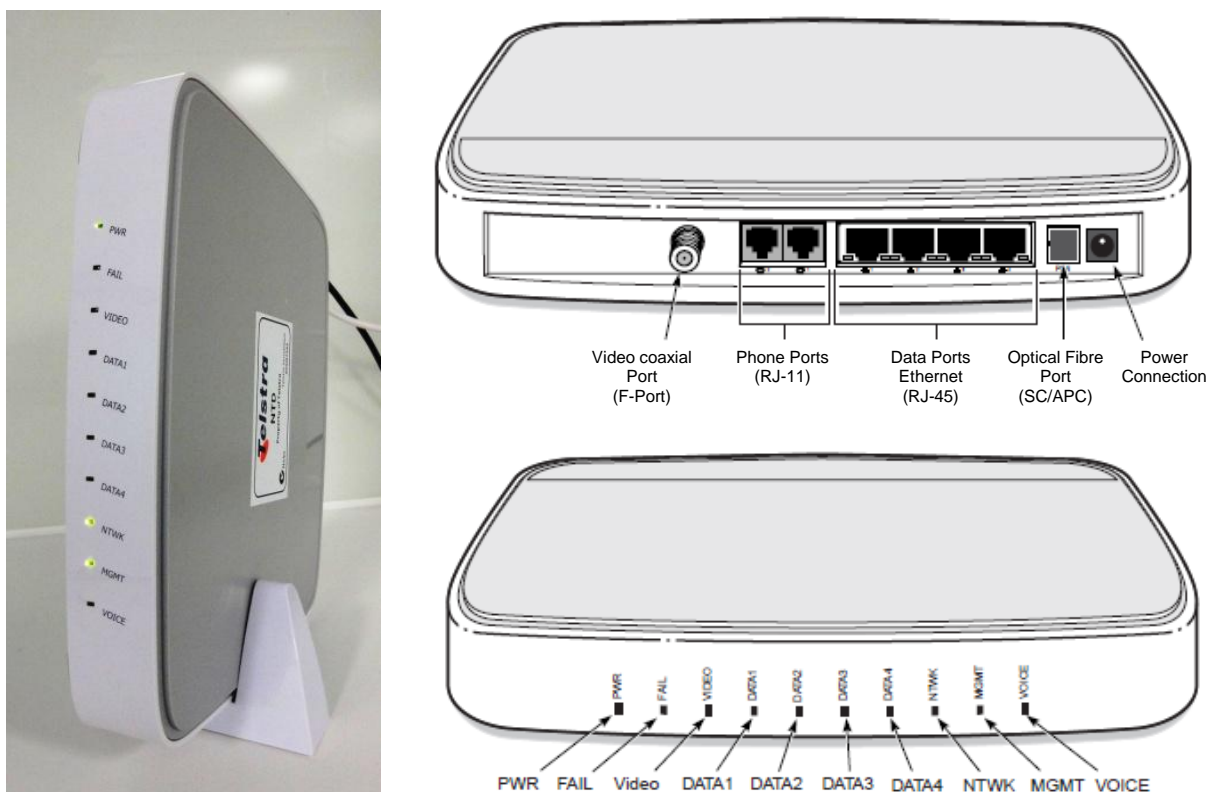
Telstra used the indoor NTD pictured in Figure 22 for apartment units until 2012. This NTD was superseded by the indoor NTD described in 3.3 (page 4).

The obsolete NTD has identical technical specifications to the current indoor NTD.

Access to the telephone and data services is via modular (“RJ”) sockets on the rear of the NTD. Access to the FTA TV/FOXTEL service is via an F-connector on the rear of the NTD. Refer to Figure 22.

Where this NTD is faulty, it will be replaced by the current NTD described in 3.3 which is smaller. The PSU will also need to be changed as the PSUs are not compatible. Where a PSU with battery backup is installed, a new (smaller) battery will be required for the replacement PSU.

**Figure 22 Obsolete indoor Telstra FTTP NTD (Alcatel-Lucent Model I-241G-A)**



**“Brick” PSU**



**PSU with optional battery backup**



Note: This NTD was usually desk-mounted vertically (as shown top left) or horizontally (as shown top right) but could be wall-mounted using a special wall bracket. Only the first data (Ethernet) port is used by Telstra.

## 7 DEFINITIONS

Term	Definition
AWG	American Wire Gauge
builder	A person charged with the construction or renovation of any building
building	A substantial construction intended to protect persons, animals, vehicles, machinery, tools or equipment from the weather
building entry point	The point on a building where telecommunications cabling enters the building
cabling	Cable or cables and any associated works or parts such as pits, poles, conduits, trays, connecting devices, jumpers, etc.
cabling provider	A person registered as a cabling provider under the <i>Cabling Provider Rules</i> (also referred to as a “cabler”)
Cabling Provider Rules	The <i>Telecommunications Cabling Provider Rules 2000</i>
CCP	Central Connection Point — a device provided as a central cable connection point for the home cabling, which may be a single, multi-socket wall plate or a patch panel
conduit	A tube or pipe that physically accommodates cables
customer	A person who subscribes to (pays for) the supply of a telecommunications network service or an end-user of that service
customer cabling	Any cabling connected on the customer's side of the NTD
customer equipment	Any equipment connected on the customer's side of the NTD
data	A general term used to describe digital information or any cable, device or port designed to carry digital signals
distributor	A collection of components used to terminate cables and which provides facilities for cross-connection by means of jumpers or patch cords
earth	An electrical connection to the mass of earth. This can be made by driving or burying a metal electrode in the ground but, within customer premises, is usually – and should be – made via a connection to the earthing bar or terminal of the electrical switchboard or to the earth electrode of the electrical earthing system. Earth may also be described as “ground”.
earthing	The act of connecting equipment or cabling to an earth reference such as to the electrical earthing system of the electrical installation or an earth electrode. Earthing may also be described as “grounding”.
Ethernet	A standard for interconnecting computers via a local area network (LAN)

## Information for builders and cabling providers

Term	Definition
external	Installed outside a building, including on the external surface of a building as well as underground or aerial (synonymous with “outdoor”)
fibre/fiber	See “optical fibre”
fly lead	A flexible cord used to connect equipment to other equipment or to a socket on a wall plate or a patch panel
FTA	Free To Air — television channels that are broadcast to the general public free of encryption or subscription fees
FTTP	Fibre To The Premises — a telecommunications network technology in which services are supplied to the customers’ premises via optical fibre
home networking	Cabling within a home that is capable of being used to link (“network”) several personal computers — see “structured cabling”
indoor/internal	Installed or located inside a building
lead-in cabling	A carrier’s (e.g. Telstra’s) cabling from the last distribution point (typically in the street) and the NTD in the customer’s premises
m	metre or metres
mm	millimetre/s — one millimetre is one thousandth of a metre
National Broadband Network (NBN)	A national telecommunications network – or, more correctly, various telecommunications networks – being established by a government-owned company, NBN Co, to provide all Australians and Australian businesses with access to high-speed broadband services
NBN	See “National Broadband Network”
NBN Co	A company established by the Commonwealth Government in 2009 to build the National Broadband Network (NBN)
network boundary (point)	The point that is deemed by legislation to be the boundary of a carrier’s telecommunications network. This is usually an MDF, an NTD or a socket.
Network Termination Device (NTD)	A device provided by a carrier to establish a demarcation point between the carrier’s telecommunications network and customer cabling or customer equipment. The NTD will be permanently marked at manufacture with the words “Network Termination Device” or the letters “NTD”. An NTD is a defined network boundary point.
NTD	See “Network Termination Device”
optical fibre	A fine, flexible, transparent fibre made of pure glass (silica) designed to convey light between two points. The American spelling, “fiber”, is often encountered but there is no actual difference between “fibre” and “fiber”.

## Information for builders and cabling providers

Term	Definition
outdoor	Installed outside a building, including on the external surface of a building as well as underground or aerial (synonymous with “external”)
outlet	Telecommunications outlet (e.g. a telephone/data socket on a wall plate)
patch cord	A flexible cord terminated with plugs to make a cross-connection between sockets or between a socket and equipment within a patch panel
patch panel	An array of sockets that may be cross-connected by means of patch cords
PCD	Premises Connection Device — an outdoor device used to connect the underground or aerial lead-in cabling to the indoor lead-in cabling
plug	A connecting device designed to be inserted into a mating socket
premises	An area of land that contains one or more buildings. In this Document, “premises” refers to the land and any building or structure located on that land. The description “building” is used in reference to any building within the premises.
readily accessible	Capable of being reached quickly and without climbing over or removing obstructions, mounting upon a chair or using a ladder
service provider	A supplier of carriage services (e.g. an internet or pay TV connection using a carrier’s network) or content services (e.g. pay TV programs or an internet website)
socket	Often also described as a “jack”, a socket is a connecting device designed to accept a mating plug
structured cabling	A term used to describe a cabling system having a structure that enables it to be used for various purposes including a local area network (LAN) and telephony — also called “generic cabling”
telecommunications network	A system, or series of systems, that is operated by a carrier or carriage service provider for carrying communications to, from or between customers by means of guided and/or unguided electromagnetic energy
Telecommunications Outlet (TO)	A fixed connecting device to which an end-user may connect customer equipment to telecommunications cabling. A telecommunications outlet includes the socket(s) and associated mounting hardware (e.g. wall plate)
Telstra	Telstra, its employees or contractors
TO (or TOs)	See “Telecommunications Outlet”
trunking	A tray or trough system with removable covers along its length that is used for housing and protecting cables — sometimes referred to as “ducting”
TV	Television

### 8 REFERENCES

Document number	Title
017153a00	Cabling of premises for telecommunications — A complete guide to home cabling
017153a01	Cabling of premises for telecommunications — Essential information for home cabling
017153a02	Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes



## 9 DOCUMENT CONTROL SHEET

Issue number	Issue date	Details on the change
1	03/06/2004	
2	01/06/2007	Revised and updated
3	15/06/2007	5.2.4 and Figures 1 & 20 amended, other minor edits
4	29/08/2007	Customer cabling options amended (6.1 to 6.4), minor edits
5	05/10/2007	Figure 1 (b) caption fixed, Figure 23 amended, Figure 34 added
6	02/01/2009	Home cabling options changed, general update
7	22/04/2009	Telstra Velocity trademark changed (from <sup>TM</sup> to <sup>®</sup> )
8	26/08/2013	Updated for indoor NTD (ONT), customer cabling information deleted