Telstra Network Termination Device (NTD)

Information for cabling providers

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Summary

This document describes Telstra's Network Termination Device (NTD) which may be used for termination of Telstra copper twisted pair lead-in cables at homes and some small businesses.

This document is optimised for reading on a tablet or portable computer to take advantage of hyperlinks, document search functions and on-screen magnification of photographs and drawings.

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CONTENTS

1 PURPOSE

The purpose of this document is to:

- describe Telstra's network termination device (NTD) for copper twisted pair cables, including its application, installation and connection arrangements; and
- authorise registered cabling providers to perform certain tasks in relation to a Telstra NTD under the terms and conditions set out herein.

This Document and related Telstra documents may be accessed under the "Builders" menu of the Telstra Smart Community® website (http://www.telstra.com.au/smart-community/builders/).

2 SCOPE

The Telstra NTD described herein may be used to connect Telstra copper twisted pair lead-in cabling to a single dwelling, individual living unit or small business that has all of the following characteristics:

- The building or unit adjoins the ground (i.e. is single storey or, if multi-storey, it includes living space on the ground floor).
- No more than four 2-wire network lines are required by the occupant.
- Telstra's lead-in cabling will not or does not terminate on a customer MDF.

Buildings or units with the above characteristics may form part of a complex comprising other similar buildings or units (e.g. villas, town houses, offices, shops) where they have been individually fed via Telstra distribution (lead-in) cabling.

3 INTRODUCTION

3.1 Interpretation

In this Document:

- A reference to "cabling" includes a reference to such things as conduits, cables and any associated joints and connections.
- "Lead-in cabling" means cabling between the Telstra distribution joint and the Telstra network boundary in the customer's premises.
- A reference to "lead-in cabling" includes a reference to any or all of the lead-in conduits, pits, poles, cables and any associated cable joints or connections.
- "Customer cabling" means cabling connected on the customer side of the NTD.
- "Telstra" includes Telstra's employees and contractors unless stated otherwise.
- "Cabling provider" means a person who is a registered cabling provider but is neither a Telstra employee nor a person doing the work under a Telstra contract.
- "Customer" means the end-user of a telecommunications service (i.e. the eventual building occupant — **not** the builder, developer or cabling provider).

Use of the words "**must**", "**must not**", "**shall**" and "**shall not**" signify:

- a legal obligation;
- an important safety, technical or operational requirement; or
- a mandatory condition of this Document.

Use of the words "**should**" or "**should not**" denote a recommendation of this Document or of a relevant standard.

Text boxed like this contains an alert or key information.

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3.2 What is a network termination device?

A network termination device (NTD) is a defined network boundary point under section 22 of the *Telecommunications Act 1997*. It is a device meeting the carrier's requirements that is provided by the carrier to establish a demarcation point between the carrier's telecommunications network and customer cabling or customer equipment, and is permanently marked at manufacture with the words "Network Termination Device" or the letters "NTD". [Source: AS/CA S009:2013]

Notes:

1. Refer to Appendix J of AS/CA S009:2013 for more information about the network boundary.
2. Telstra uses a different NTD than the one described in this Document to terminate optical fibre lead-in cable for Telstra FTTP (Fibre To The Premises). This NTD is described in Telstra Document No. 013234, *Cabling of new homes for Telstra FTTP — Information for builders and cabling providers*, and Telstra Document No. 012882, *Alteration of Telstra facilities in homes & small businesses — Information for cabling providers*, both of which may be accessed under the "Builders" menu of the Telstra Smart Community website (http://www.telstra.com.au/smart-community/builders/).

3.3 Why use an NTD?

An NTD provides a clearer demarcation point than the first telecommunications outlet ("first socket"), which is often difficult to identify if there is more than one outlet in the building. An NTD also provides greater cabling/service flexibility by enabling telecommunications outlets to be star wired from the NTD (although star wiring from the NTD is no longer recommended — refer to 5.1).

An NTD should be used as an external network interface for a structured cabling system (e.g. a home networking system) in accordance with Australian Standard AS/NZS ISO/IEC 15018, *Information technology — Generic cabling for homes*, and Standards Australia Handbook HB 252, *Communications Cabling Manual Module 3: Residential communications cabling handbook*.

Additional features of the Telstra NTD are as follows:

- It can house an optional DSL (ADSL/ADSL2+) centralised filter for each line.
- It uses tool-less, gel-filled terminations for connection of cable pairs.
- A test socket is provided on each line, which automatically isolates the customer cabling when a plug is inserted and which the customer, cabling provider or service provider may use to test the DSL or phone service at the NTD.
- Bridging test points are provided on each line to enable in-service line monitoring or testing by service personnel.
- The NTD has inbuilt Customer Lightning Protection (a suitable equipotential bonding/earthing conductor is required to make it effective).

3.4 Where an NTD should not be used

A Telstra NTD should **not** be used to connect network services for two or more customers except in cases where there is a direct relationship between the customers, e.g. it may be used to connect a separate service to a granny flat, home office, or close relative living in the same premises as the main occupant.

Note: The NTD contains a customer-accessible test socket for each line. While the cover of the NTD can be padlocked by the customer, the test socket covers cannot be individually locked for security/privacy purposes in multi-customer situations.

Duplexes, multiple adjoining units or detached houses/units require individual Telstra NTDs (where fed by individual lead-in cables) — or they may be connected via a common customer MDF located in a common area.

A Telstra NTD must **not** be used on the customer side of any other network boundary device, i.e. a customer MDF, another NTD or the first TO ("first socket").

3.5 Who installs the NTD?

3.5.1 General

In principle, the NTD should be provided by the carrier (Telstra) because it is part of the carrier's (Telstra's) network. However, Telstra authorises a cabling provider to install the Telstra NTD described in this Document under the circumstances described in 3.5.3.

3.5.2 Circumstances under which Telstra may install an NTD

An NTD shall be installed for all new installations after 1st March 2017.

3.5.3 Circumstances under which a cabling provider may install the NTD

3.5.3.1 New installations

For a new installation, Telstra will normally supply and install the NTD at no charge. Customer cabling beyond the NTD is the responsibility of the customer. For expediency, a cabling provider may install a Telstra NTD and terminate the customer cabling on it ready for connection of the lead-in cabling by Telstra, Telstra has no objection to the cabling provider supplying and installing the Telstra NTD under the conditions set out in 4.4.3.

Note: Telstra will not connect lead-in cabling to:

- an NTD that has not been installed in accordance with this Document; or
- any device purported to be an NTD unless it is the Telstra NTD described in this Document or it is a customer MDF that complies with Australian Standard AS/CA S009 (wiring rules) and Telstra Document No. 017153a08, *Cabling of premises for telecommunications — Telstra requirements for customer MDFs*.

3.5.3.2 Existing installations

For an existing installation where the existing network boundary is the first TO in the building, Telstra authorises a cabling provider to install a Telstra NTD under the general conditions set out in Telstra Document No. 012882, *Alteration of Telstra facilities in homes & small businesses — Information for cabling providers* (otherwise known as "A2A"), and the conditions set out in 4.4.3 of this Document.

Telstra retains the right at Common Law to seek damages from a cabling provider if Telstra incurs costs due to any work improperly performed by the cabling provider.

Note: Common law is "unwritten law" based on custom or court decision. Under the common law of negligence, persons owe Telstra a duty of care to take all reasonable precautions not to damage Telstra's facilities. Telstra may bring a claim against a cabling provider who interferes with or damages Telstra's facilities or services in a manner that results in Telstra suffering loss.

3.6 Who maintains the NTD?

Telstra will maintain/repair a properly installed Telstra NTD for "fair wear and tear" as part of the Telstra network no matter who installed it in the first place. Refer to 6.4 for more information.

4 DESCRIPTION OF THE TELSTRA NTD

4.1 General

The Telstra NTD is shown in Figure 1. It is designed for installation on the external wall of the building to connect the underground or aerial Telstra lead-in cabling to the customer cabling.

The NTD comprises a plastic enclosure with two hinged covers, one for customer access and one for "Telco" (Telstra) access, and one or more connection modules.

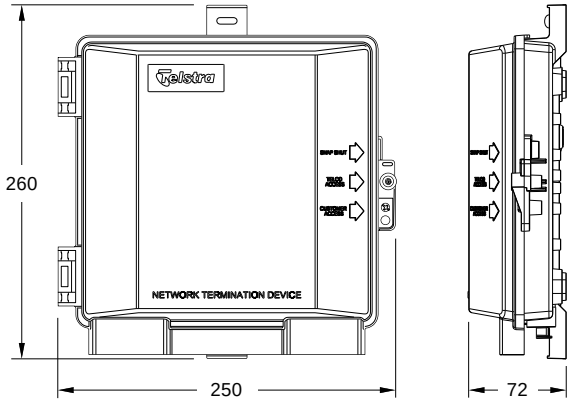
The customer access cover is secured by a clip lock, screw and an optional customer padlock. The screw accepts either a flat-blade screwdriver or a Phillips-head screwdriver. If the customer locks the cover with a padlock, a "Torx" T20H screwdriver may be used to bypass this lock. The Telco access cover is located under the customer access cover and must be opened using the "Torx" tool.

Cables are connected within the NTD using "line modules", each of which contains inbuilt lightning protection, a test socket and, optionally, a DSL (ADSL/ADSL2+) centralised filter. A special module is also available to terminate 10-pair moisture barrier cable, which Telstra uses as the standard lead-in cable for rural areas.

Figure 1 Telstra NTD

NTD with the cover closed

NTD dimensions (mm)

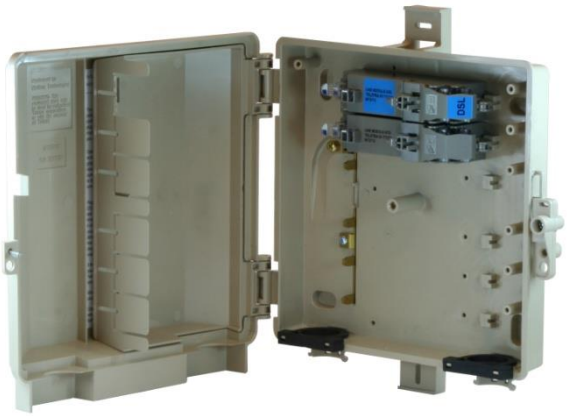


See Figure 30 for the cover locking arrangements

40 mm is required to the left of the NTD to open the cover

Main cover open exposing the customer side

Telco cover open exposing the Telstra side



Notes:

1. The NTD is beige (light brown) in colour and has two hinged covers — the main cover, which provides access to the customer side of the NTD, and an internal cover, which provides access to the Telco (Telstra) side of the NTD. The NTD contains an earthing terminal and earthing bar for Customer Lightning Protection.
2. The main cover clips shut and is secured by a standard screw. The customer may also secure it with a padlock. A Torx screwdriver is required to open the main cover if it has been padlocked by the customer. A Torx screwdriver is also required to open the Telco cover. The Telco cover is to prevent customer access to the earthing terminals and any Telstra network devices installed in the NTD.

4.2 NTD capacity

4.2.1 Line/Service capacity

The NTD has a maximum capacity of:

- **urban areas:** 6 line modules, each capable of connecting one telephone service and, optionally, one associated DSL (ADSL/ADSL2+) service
- **rural areas:** 3 line modules, each capable of connecting one telephone service and, optionally, one associated DSL (ADSL/ADSL2+) service, plus one rural cable connection module.

A fully equipped Telstra NTD will have limited customer cable termination capacity due to limited physical space within the NTD. See 4.2.2 for details.

For a **new** installation (e.g. a new building), the NTD should only be used to connect:

- **urban areas:** up to 4 telephone services and, optionally, up to 4 associated DSL (ADSL/ADSL2+) services
- **rural areas:** up to 2 telephone services and, optionally, up to 2 associated DSL (ADSL/ADSL2+) services.

Where more services are required initially, a customer MDF should be installed.

Note: The reduced initial equipped capacity of the NTD is to allow for the subsequent supply of additional services without the need to upgrade to a customer MDF.

4.2.2 Cable capacity

The Telstra NTD terminates twisted pair cables and bonding/earthing conductors as described below. The NTD does not provide for termination of coaxial or optical fibre cables.

The Telstra side of the NTD will accept:

- up to 3 x 2-pair lead-in cables or, for rural areas, 1 x 10-pair cable; and
- up to 2 x 6 mm² equipotential bonding/earthing conductors.

The customer side of the NTD will accept:

- up to 12 x 5 mm diameter customer cables (e.g. 4-pair Category 5 UTP cables) as long as the lowest line module position is not equipped; or
- up to 8 x 5 mm diameter customer cables if the lowest line module position is equipped; or
- a lesser number of cables having a diameter greater than 5 mm (e.g. Category 6 or 6_A cables).

A cabling provider is **not** authorised to install a Telstra NTD where:

- the lead-in cabling exceeds a total capacity of 5 pairs; or
- more than 8 customer cables (maximum of 4 pairs each) are to be connected

4.2.3 Other carriers' cables

The NTD shall **not** be used to connect a cable from another carrier's network other than a cable connected between the customer side of that carrier's NTD, first TO, fixed wireless terminal, satellite terminal or a customer MDF and the customer side of the Telstra NTD.

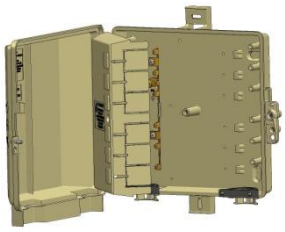
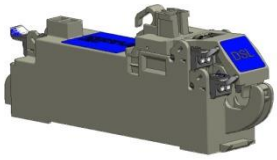
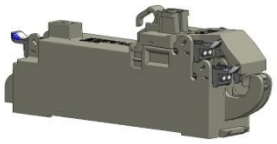
Note: Where there is a need to terminate lead-in cabling from more than one carrier on the same device, a customer MDF should be used.

4.3 Procurement

The enclosure and the required modules must be ordered separately. The component parts of the NTD are described in Table 1.

The Telstra NTD is supplied by Madison Technologies www.madisontech.com.au. For Madison part numbers, refer to Table 1.

Table 1 Telstra NTD components

Part No.	Description	Application
Madison MT2710 Telstra 7700124	NTD enclosure, beige: • has separate covers for customer and Telco access • includes an equipotential bonding/earthing terminal and an earthing bar • houses up to 6 line modules or 3 line modules plus 1 rural cable module 	Empty enclosure for housing of line modules
Madison MT2711 Telstra 7700125	Line module, DSL, including: • integrated centralised DSL filter • tool-less cable terminations for 0.40 mm to 0.64 mm diameter solid copper conductors • inbuilt overvoltage protection with bonding/ earthing connection • bridging test terminals on both the Telco and customer sides of the module • RJ11 customer test socket • automatic isolation of customer cabling when the test socket is used • 1 x DSL and 3 x telephone cable connection terminals 	Module with a centralised DSL filter for connection of a DSL (ADSL/ ADSL2+) service where the building is cabled separately from the NTD for DSL and telephone services
Madison MT2712 Telstra 7700126	Line module, standard, including: • tool-less cable terminations for 0.40 mm to 0.64 mm diameter solid copper conductors • inbuilt overvoltage protection with bonding/ earthing connection • bridging test terminals on both the Telco and customer sides of the module • RJ11 customer test socket • automatic isolation of customer cabling when the test socket is used • 4 x telephone cable connection terminals 	Standard module for connection of one line. For a DSL service, a separate centralised filter must be installed or distributed (in-line) filters must be used for connection of telephone devices.
Madison MT2713 Telstra 7700127	Line module, rural, including: • inbuilt differential earth clamp • tool-less terminations for bonding of spare cable pairs • separate earthing terminal for bonding of moisture barrier and guard wire conductors  **This is included for information only. Cabling providers are not authorised to install this module.**	Additional module for connection of 10/0.64 MBHJC rural lead-in cable — must be installed and connected by Telstra
Madison MT2718 Telstra 11600281	Security Screwdriver, Torx T20H 	Tool for access to a locked NTD and to the Telco side of the Telstra NTD
N/A	Sealed wire termination module (4 bridged pairs) • Products of this type may be available from some Australian suppliers and are commonly marketed as a “VOIP module”. • Such a module will be connected on the customer side of the NTD and therefore must be ACMA-compliant (e.g. A-ticked). 	Optional customer cable termination module for “Mode 3” connections, extra star-wired cables or VOIP connections

4.4 What a cabling provider is authorised to do

4.4.1 Connection of customer cabling

A cabling provider is authorised to connect customer cabling to the customer side of the Telstra NTD as described in this Document.

Customer cabling shall **not** be connected to:

- any cable pair, terminal or joint on the Telstra side of the NTD;
- any Telstra lead-in pair other than via connection to the customer side of a line module MT2711 or MT2712 described in ; or
- any earthing bar or terminal on the Telstra side of the NTD.

4.4.2 Testing

A cabling provider is authorised to test a pair or service within the NTD by any of the following means:

(a) using the test socket on any line module

(b) using the bridging test terminals on the customer side of any line module

(c) using the bridging test terminals on the Telstra side of any line module

(d) disconnecting a cable pair on the customer side of any line module

(e) disconnecting a cable pair on the Telstra side of any MT2711/MT2712 line module.

Refer to Section 6 for more information.

4.4.3 Installation

A cabling provider is authorised to install the Telstra NTD described in this Document under the general conditions set out in Telstra Document No. 012882, *Alteration of Telstra facilities in homes & small businesses — Information for cabling providers* (otherwise known as “A2A”), and the following:

(a) The NTD shall **not** be installed if Telstra’s lead-in cabling terminates on, or will terminate on, a customer MDF.

(b) The NTD used shall be Telstra’s NTD (as described in this Document).

(c) The NTD shall **not** be used to connect more than one household (inclusive of a “home office” or “granny flat”) or one office/business (see 3.4).

(d) The NTD shall be located on the external wall of the same building in which the telecommunications service(s) will be used by the customer and shall **not** be installed at any point away from the building (e.g. at a fence, pole or any other detached structure). Any NTD located away from the building must be installed by Telstra (see 5.4.4).

(e) The lead-in cabling to which the NTD is to be connected shall **not** exceed a total capacity of 5 pairs (e.g. 1 x 5-pair cable or 2 x 2-pair cables).

(f) The NTD shall **not** be used to connect more than a total of 8 x 4-pair customer cables or a cable (or cables) of equivalent size (see 4.2.1 and 4.2.2).

(g) The NTD shall **not** be used to connect a cable from another carrier’s network other than a cable connected between the customer side of that carrier’s NTD, first TO, fixed wireless terminal, satellite terminal or a customer MDF and the customer side of the Telstra NTD.

(h) The NTD shall be installed in accordance with Section 5 of this Document.

(i) The customer (building occupant) shall be informed of the NTD installation in accordance with 5.11.

(j) Telstra shall be notified of the NTD installation within 14 days in accordance with 0.

(k) The cabling provider shall **not** seek reimbursement from Telstra for any costs associated with the supply and installation of the Telstra NTD.

4.4.4 Alteration

A cabling provider may replace an obsolete Telstra NTD with the Telstra NTD described in this Document under the general conditions set out in Telstra Document No. 012882, *Alteration of Telstra facilities in homes & small businesses — Information for cabling providers* (otherwise known as "A2A"), the conditions set out in 4.4.3 and the following:

(a) The NTD shall **not** be replaced if the Telstra lead-in cabling has more than a total of 5 pairs (i.e. more than 1 x 5-pair cable or 2 x 2-pair cables).

(b) The location of the NTD shall **not** be changed.

Note: The NTD may be repositioned at the same location, e.g. higher or lower, as long as the positioning of the NTD complies with the requirements set out in Section 5.

With the Telstra NTD described in this Document, a cabling provider may replace:

(c) an obsolete line module with a new line module; or

(d) a standard line module with a DSL line module.

A cabling provider shall **not** replace a DSL line module with a standard line module whether or not a DSL service is in use at the premises unless:

(e) a single-ended connection for a high-speed data service (e.g. SHDSL) is to be made to the NTD line module; and

(f) the presence of an unterminated centralised filter within the DSL line module is likely to have a detrimental effect on the high-speed data service.

Notes:

1. The DSL line module may have been provided by Telstra to block spurious high frequency signals originating from the building, which may otherwise be injected into the Telstra network causing disruption to DSL services.
2. A high-speed data service may be connected to the unfiltered ("DATA") terminals of the DSL line module if the integrated (but unterminated) centralised DSL filter circuitry has no detrimental effect on the service.

4.5 What a cabling provider is not authorised to do

A cabling provider is **not** authorised to:

(a) install a Telstra NTD where "lead-in extension cabling" described in 5.2 is installed or needs to be installed;

(b) connect any customer cabling or customer equipment to the earthing bar or any terminal on the Telstra side of the NTD;

(c) install a Telstra NTD at any point away from the customer's building (e.g. on a fence, pole or detached building or structure);

(d) install or connect a rural cable connection module (MT2713); or

(e) disturb a rural cable connection module (MT2713) or any other Telstra network device installed on the Telstra side of the NTD other than to carry out testing in accordance with 4.4.2 (e) or replace a line module in accordance with Clause 4.4.4 (c) or (d).

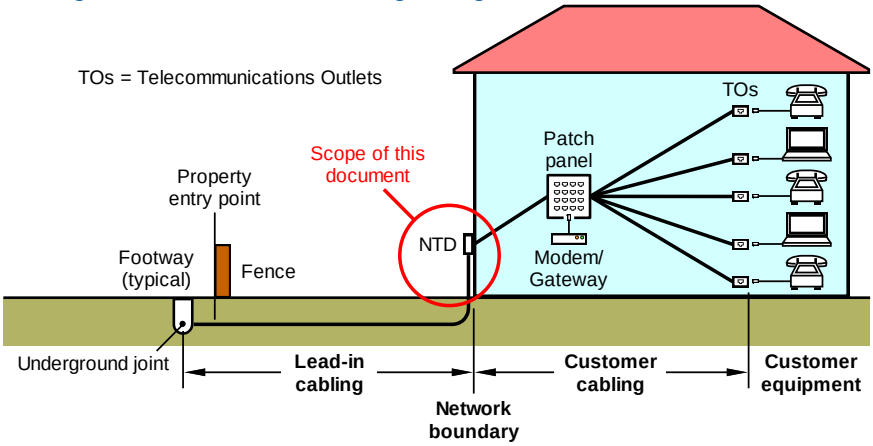
5 TELSTRA NTD INSTALLATION

5.1 Cabling arrangement

Figure 2 and Figure 3 show Telstra's standard cabling arrangement for copper twisted pair lead-in cabling. These arrangements are particularly suited to the installation of a DSL service using a centralised filter module housed in the NTD. Figure 2 is the recommended arrangement to ensure compatibility with FTTP (Fibre To The Premises), e.g. the National Broadband Network (NBN). For more details, refer to Telstra Document No. 017153a01, *Cabling of premises for telecommunications – Essential information for home cabling.*

Note: Any cabling beyond a Network Termination Device is customer cabling and is the responsibility of the customer.

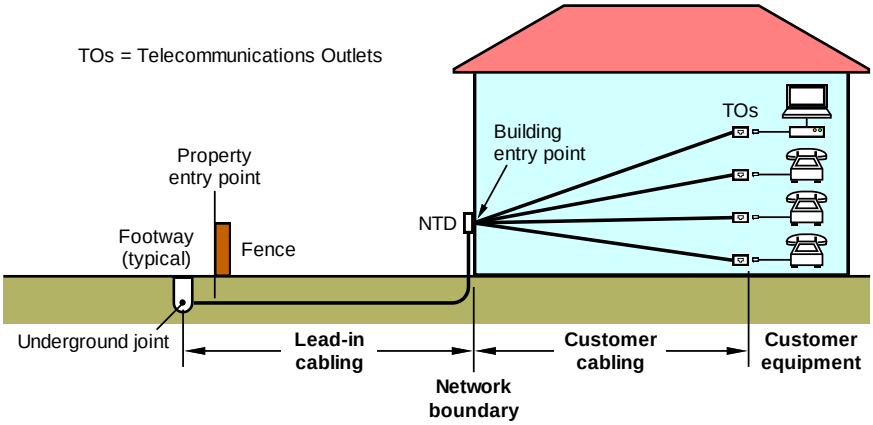
Figure 2 Recommended cabling arrangement for all new installations



Note: Star wiring from an internal distribution point (e.g. a patch panel) using Category 5 (or "5e") or Category 6 cables improves the flexibility of the cabling system, ensuring compatibility with FTTP (Fibre To The Premises), e.g. the National Broadband Network (NBN), and enabling the cabling to be used for wired networking of computers. For more information, refer to 5.9.5 and Telstra Document No. 017153a01, *Cabling of premises for telecommunications — Essential information for home cabling*.

Figure 3 A Possible cabling arrangement using an external NTD

(Not recommended for new installations)

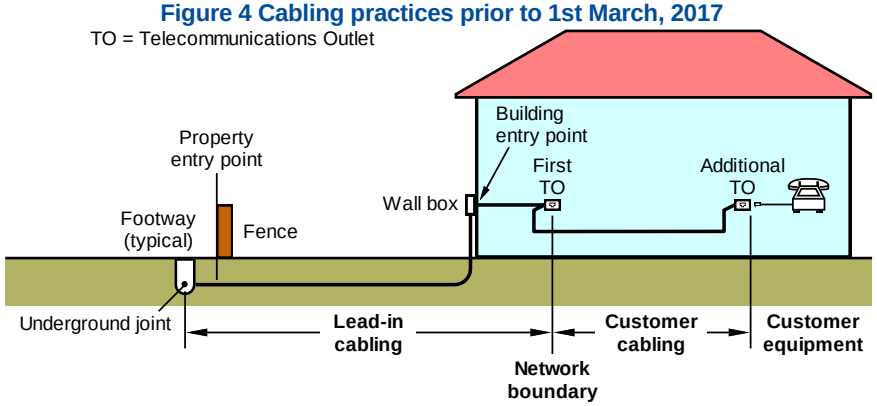


Notes:

1. Category 5 (or "5e") or Category 6 cable should be used for the internal (indoor) cabling to maximise flexibility and performance for current and future telecommunications services.
2. Star wiring from an internal distribution point (instead of from the NTD) is recommended for new installations (see Figure 2).

For reference only, Figure 4 shows Telstra's standard cabling arrangement prior to the 1st March 2017 for most existing homes using a wall box. As of the 1st March 2017, a Telstra NTD shall be installed and is mandatory on all **new** installations.

Figure 4 Cabling practices prior to 1st March, 2017



Notes:

1. Prior to 1st March 2017, Telstra's standard cabling practice was to connect the underground or aerial lead-in cable to the indoor lead-in cable within an external wall box, as shown above.
2. Additional TOs should be cabled from the first TO and not from the external wall box.
3. Many homes constructed or cabled prior to 1997 are cabled directly to the first TO without an intermediate external connection device. In some cases, the lead-in cable is fully or partially concealed in the wall cavity.

5.2 Surge suppression

5.2.1 Customer Lightning Protection (CLP)

Telstra provides surge suppression for the protection of end-users in defined high lightning risk situations (Telstra calls this "Customer Lightning Protection" or "CLP"). The Telstra NTD line modules have inbuilt protectors and the NTD enclosure incorporates an earthing terminal and an earthing bar. To provide CLP within the NTD, all that needs to be done is connect an equipotential bonding (earthing) conductor to the earthing terminal on the earthing bar inside the NTD.

Note: The NTD earthing terminal should always be equipotentially bonded to the electrical earthing system where possible to take advantage of the inbuilt lightning protection for the customer's benefit.

The essential requirements for provision of effective CLP are:

- a telecommunications surge protective device ("protector") **at the end-user's building** (the line modules of the Telstra NTD have inbuilt protectors);
- a **short** equipotential bonding conductor (ideally **less than 1.5 m**) between the building electrical earthing system and the telecommunications protector; and
- an earth electrode **at the end-user's building** (the electrical earth electrode serves this purpose if it exists, otherwise an auxiliary earth electrode must be provided).

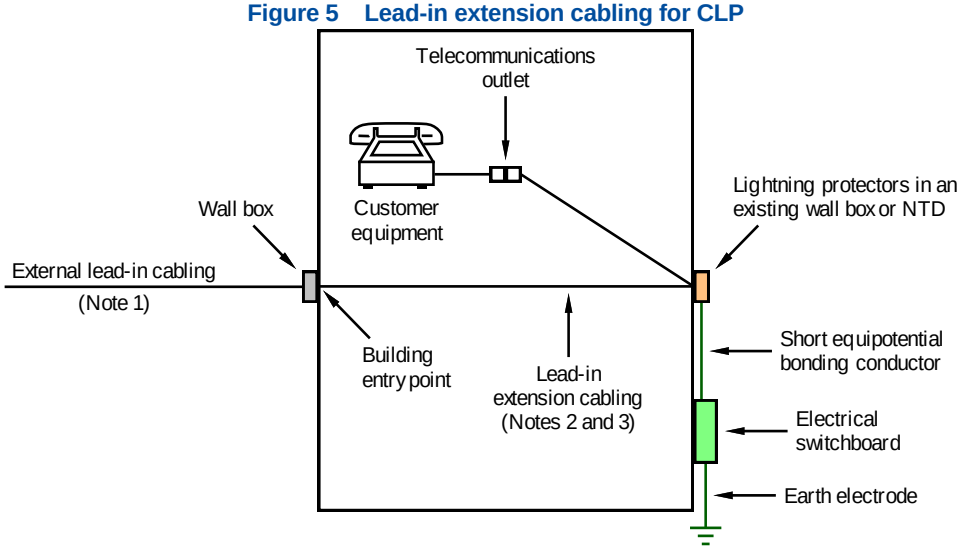
If the lead-in cabling does not meet the building near the electrical switchboard, it may be necessary to install "**lead-in extension cabling**" between the point where the lead-in cabling meets the building and the NTD which must be located near the electrical switchboard to enable short bonding between the NTD and the main earthing bar of the electrical switchboard. This principle is shown in Figure 5 and is explained in more detail in Telstra Document No. 012882, *Alteration of Telstra facilities in homes & small businesses — Information for cabling providers* (otherwise known as "A2A").

Cabling providers are **not** authorised to install a Telstra NTD where **lead-in extension cabling** is installed or needs to be installed.

5.2.2 Equipment lightning protection

CLP provided in accordance with 5.2.1 may also serve as primary protection for customer equipment in accordance with Australian Standards AS 4262.2 and AS/NZS 1768. Secondary protection may also be provided and is normally provided within the equipment or as close as possible to the equipment.

Figure 5 Lead-in extension cabling for CLP



Notes:

1. With new lead-in cabling, Telstra tries to ensure that the lead-in trenching and cabling are run to the same side of the building as the electrical switchboard. However, this doesn't always happen for various reasons and certainly can't be guaranteed for older established buildings.
2. Where the lead-in cabling runs to the opposite side of the building to the electrical switchboard and CLP is required, "lead-in extension cabling" is required to achieve a short equipotential bonding conductor between the electrical earthing system and the lightning protectors. The total length of the bonding/earthing conductor between the earthing bar in the electrical switchboard and the lightning protector should preferably be less than 1.5 m but in any case must not exceed 10 m.
3. Where lead-in extension cabling is required, such cabling must either be installed on the external perimeter of the building or the conductors of the cable used must be at least double the cross-sectional area of the external (aerial or underground) lead-in cabling to minimise the risk of fire under surge conditions.
4. Cabling providers are **not** authorised to install a Telstra NTD where lead-in extension cabling is installed or needs to be installed. The lead-in extension cabling and NTD must be installed by Telstra.

5.3 Digital Subscriber Line (DSL)

5.3.1 Description

DSL uses the customer's standard telephone line to supply a high-speed data ("broadband") service. The telephone service occupies the lower voice frequency (VF) bandwidth while the DSL service uses a high frequency bandwidth. These frequency bands are transmitted over the same pair of wires and are filtered out of the line at the customer's premises. A low-pass filter is installed between the line and telephone equipment (including fax machines, answering machines, tone ringers, etc.) to block the DSL signals, and a high-pass filter is used in the DSL modem to block the telephone signals.

The DSL modem has an in-built high-pass filter, so only the low-pass filter needs to be installed in series with any telephone equipment. There are two ways of doing this:

- **distributed filters** ("in-line filters") connected in series with each telephone device (these are fitted in the line cord, usually at the wall plate, so that customers can fit it themselves); or
- a **centralised filter** ("central filter" or "remote splitter") installed in the fixed wiring (this must be done by the carrier or a registered cabling provider).

A central filter is more effective at avoiding customer premises wiring problems and interference than using distributed filters and, in any case, must be used where any "Mode 3" connection is required, e.g. for a monitored security alarm or a personal response (emergency call/medical alert) system.

For more information about DSL, refer to Telstra Document No. 017153a00, *Cabling of premises for telecommunications — A complete guide to home cabling*, or 012882, *Alteration of Telstra facilities in homes & small businesses — Information for cabling providers*.

5.3.2 Central filter location

Where a central filter is to be installed, there are three options:

(a) a DSL line module may be fitted in the Telstra NTD as shown in Figure 6 (a);

(b) a suitable central filter may be installed in the customer compartment of the Telstra NTD as shown in Figure 6 (b); or

(c) the central filter may be installed in the customer cabling outside the Telstra NTD on the external wall or at a suitable location inside the building (typical filters are shown in Figure 7).

Note: Certified DSL central filters ("remote splitters") for connection on the customer side of the NTD are listed on the Telstra website at http://www.telstra.com.au/adsl/equipmnt.htm.

Figure 6 Central filter installed within a Telstra NTD

(a) DSL line module **(b) Filter in the customer compartment**

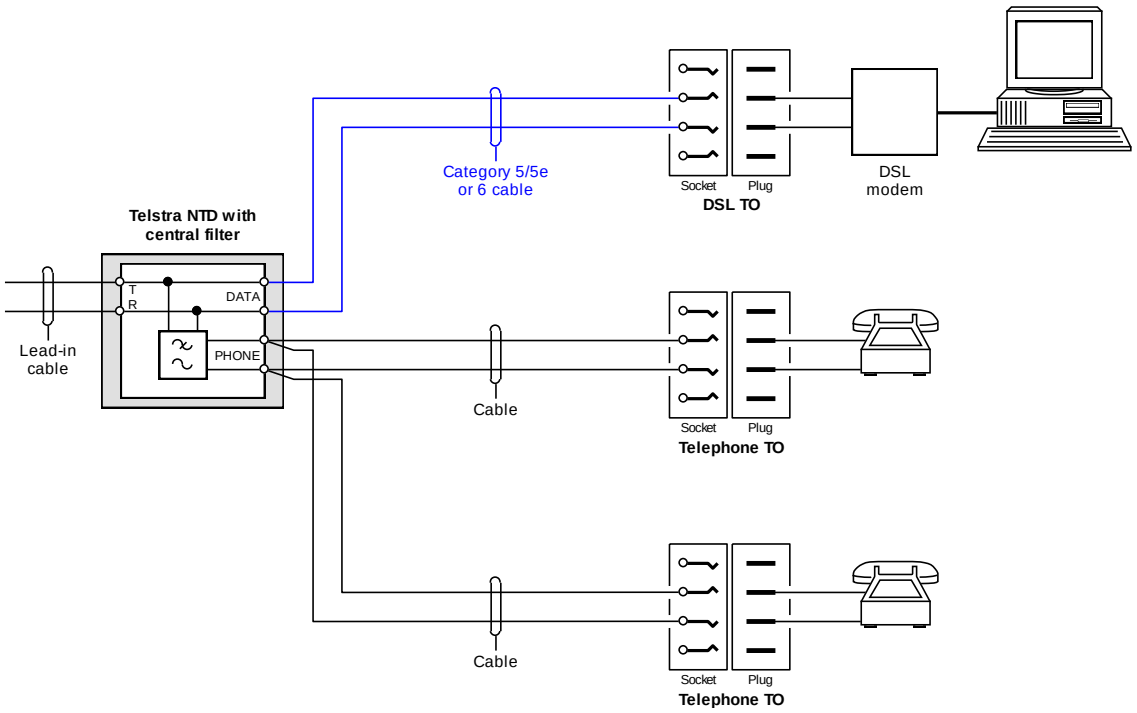
Figure 7 Typical central filters for connection in the customer cabling

5.3.3 Cabling from a central filter located in the Telstra NTD

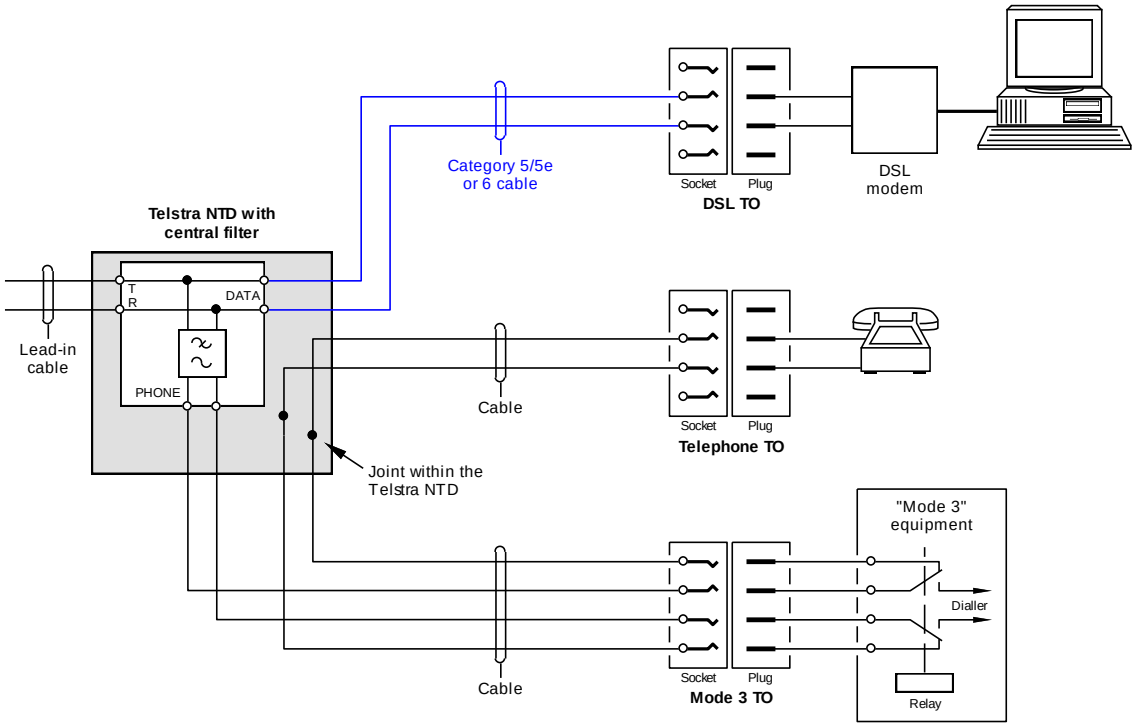
Typical cabling arrangements where the central filter is installed in the NTD are shown in Figure 8. For more information, refer to 5.9.4 (page 39).

Figure 8 Typical cabling where the central filter is installed in the Telstra NTD

(a) Standard wiring (no "Mode 3" connection)



(b) Wiring where a "Mode 3" connection is required



5.4 NTD location

5.4.1 General

While Telstra will normally supply and install the Telstra NTD where required, a cabling provider needs to know Telstra's NTD location requirements for the purpose of pre-wiring the building. If, for the sake of expediency, a cabling provider prefers to install the NTD at the building and connect the customer cables to it, ready for Telstra to connect the lead-in cabling at building completion, the cabling provider is authorised to install the NTD under the conditions set out in 4.4.3.

The NTD shall be installed on the external wall of the building at a position where it can be safely accessed without the use of a ladder, preferably outside any fences or barriers adjoining the building that may prevent Telstra access to the NTD for testing while the customer is absent. As the customer may access the NTD to test the services, it is important that it can be accessed safely and easily.

The Telstra NTD shall **not** be installed inside the building.

Note: The NTD contains inbuilt lightning protection, which may ignite or explode under extreme surge conditions.

5.4.2 NTD housed in a combined utilities enclosure (CUE)

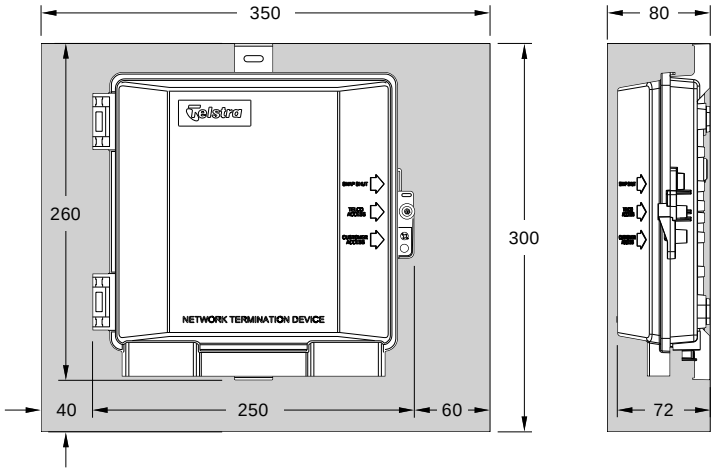
For new buildings, it is recommended that the Telstra NTD be installed in a combined utilities enclosure (CUE) with the electricity meters and/or electrical switchboard to:

- improve the overall appearance of the building;
- simplify installation of the NTD, conduits and cables;
- facilitate effective equipotential bonding (earthing) of the lightning protectors in the NTD;
- provide greater weather protection for the NTD and customer cables;
- provide storage space for the required slack in the telecommunications cables;
- avoid problems with mounting the NTD on low-density cladding material such as polystyrene;
- improve accessibility by service personnel; and
- assist in implementing standardised installation practices.

The minimum clearances required around the NTD within a CUE or any other enclosure are indicated in Figure 9.

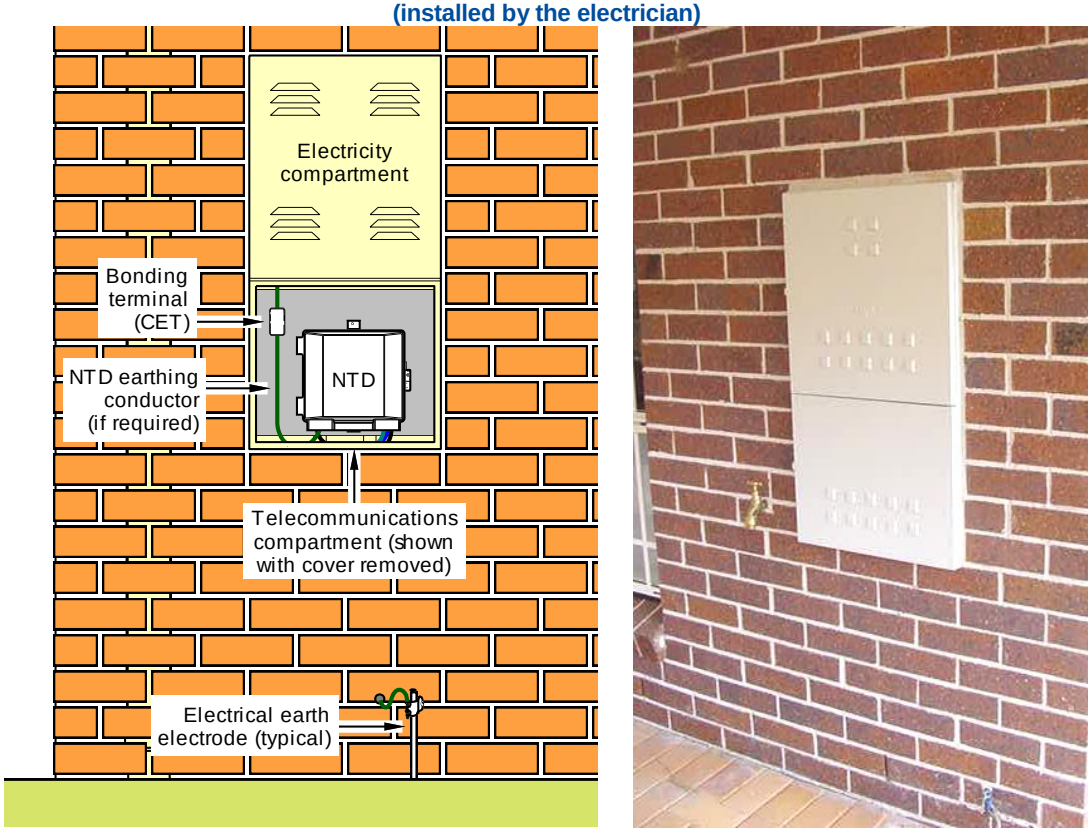
A typical CUE is pictured in Figure 10. The CUE must be provided by the builder's electrician as part of the electrical installation. Telstra's CUE requirements are described in Telstra Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes*.

Figure 9 Minimum clearances required around the NTD



Note: The minimum space required for NTD access is indicated by the shaded area. At least 40 mm clear space is required to the left of the NTD to open the cover 90° and at least 60 mm is required to the right of the NTD to disengage the cover clip by hand. A minimum of 40 mm is required below the NTD for cable access.

Figure 10 Combined electricity and telecommunications enclosure (installed by the electrician)



Note: The equipotential bonding conductor for the CET (Communications Earth Terminal) must be installed by the electrician. The CET may be installed by either the electrician or the telecommunications installer. For details, see Telstra Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes*.

5.4.3 Where a combined utilities enclosure (CUE) is not provided

5.4.3.1 General

Where a CUE is not provided, the NTD should be located near the external electricity enclosure (meter panel or switchboard), as shown in Figure 13. A minimum distance of 150 mm should be maintained between the NTD and any building fixtures (such as other service enclosures, downpipes, fences, etc.).

If the lead-in cabling does not run to a point near the electricity enclosure, the NTD may be installed near the point where the lead-in cabling meets the building as long as Customer Lightning Protection (CLP) is not required such that there may be a need to install “lead-in extension” cabling as described in 5.2.1 on page 15. Where the NTD is not located near the electricity enclosure, care must be taken to avoid gas cylinders (see 5.4.3.3) which are normally located away from the electricity enclosure.

The NTD shall be mounted on a vertical surface with the cable entry ports at the bottom. It shall **not** be mounted on a horizontal surface, sideways, upside down or on the building fascia, bargeboard or eaves. The NTD shall be positioned on the wall in accordance with the following requirements:

- The bottom of the NTD shall be at least 500 mm and no more than 1300 mm from finished ground level (FGL). See Figure 13.
- Clear access space should be provided in front of the NTD in accordance with Figures D2 and D3 of AS/CA S009:2013 (see Figure 14).

5.4.3.2 Low-density wall cladding (e.g. polystyrene)

If low-density wall cladding such as polystyrene is to be used, suitable backing board must be provided by the builder behind the cladding at the NTD location to support the NTD. In such cases, the intended position for the NTD should be marked on the building plan or the actual building by the builder.

5.4.3.3 Separation from gas facilities

The NTD must be positioned:

- at least 500 mm above or 1000 mm to the side of any gas meter or associated fitting in accordance with Figure 11
- outside the conical exclusion zone around any gas cylinder as shown in Figure 12.

Lead-in conduit/cabling and customer conduit/ cabling running to/from the NTD must be separated from any gas pipe, gas meter, gas cylinder or associated fitting by a minimum distance of 150 mm (see 5.13.4.6 on page 53).

Figure 11 Exclusion zone for gas meters

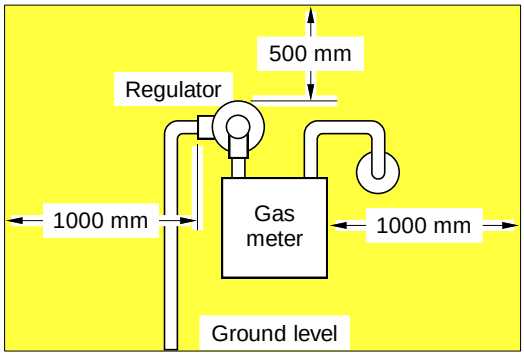
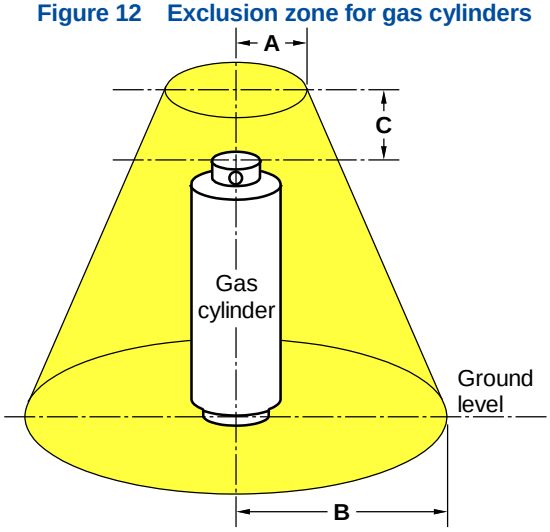


Figure 12 Exclusion zone for gas cylinders



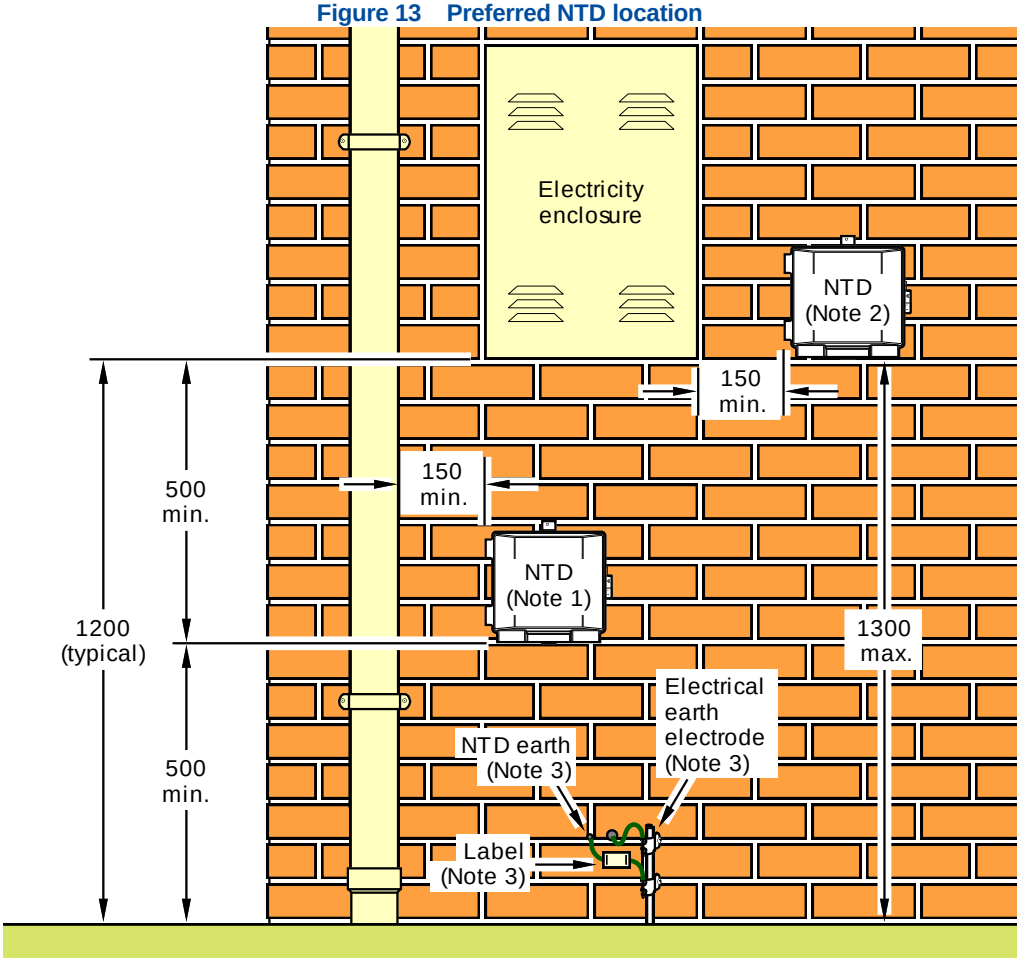
	Exchange cylinder	In-situ fill cylinder
A	500 mm	1500 mm
B	1500 mm	3500 mm
C	500 mm	500 mm

5.4.3.4 Separation from water services

The NTD shall be positioned at least **300 mm** in any direction from a **water meter** or **water tap**.

Lead-in conduit/cabling and customer conduit/cabling running to/from the NTD should be separated from any water pipe, water meter or associated fitting by a minimum distance of 50 mm.

Figure 13 Preferred NTD location



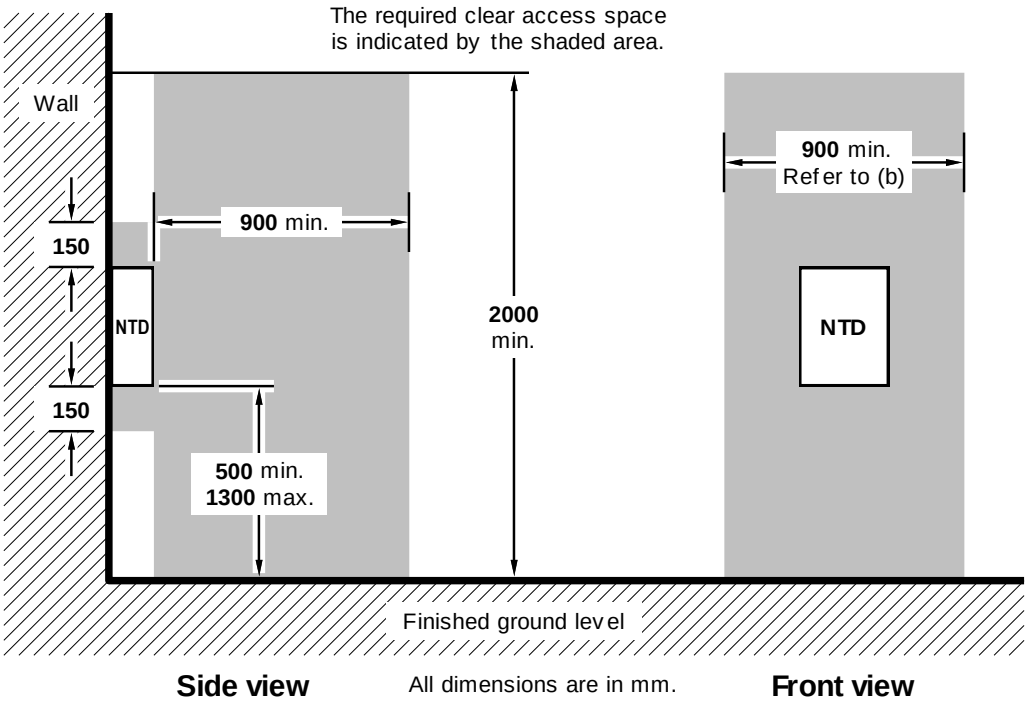
All measurements are in mm.

Notes:

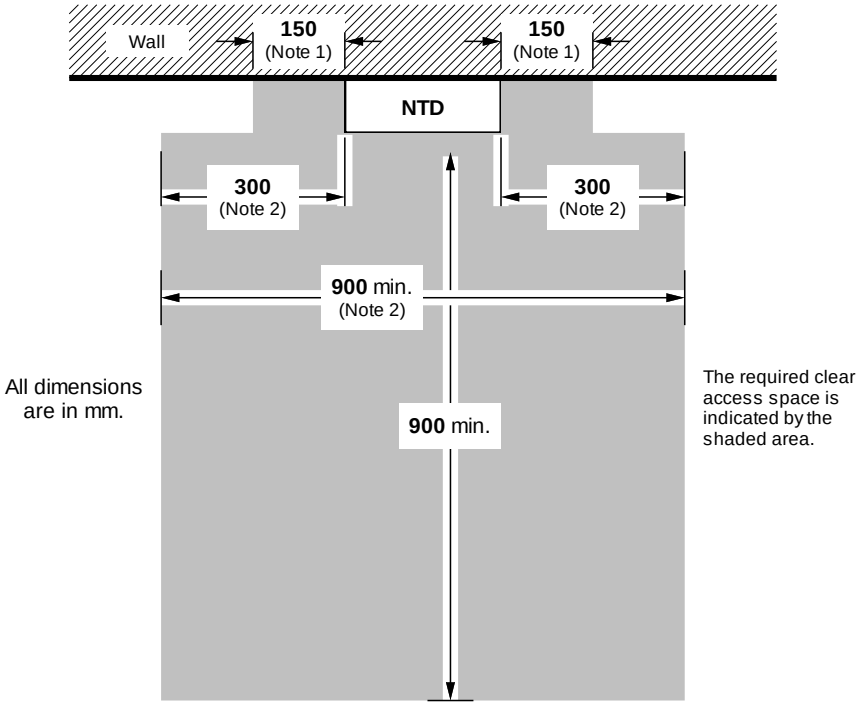
1. In areas that do not have a reticulated gas service (including homes where cylinder gas will be used), the preferred location for the NTD for new buildings under construction is below the electricity enclosure at a height of 500 mm to 600 mm above finished ground level. Locating the NTD below the electricity enclosure minimises the risk of obstruction by such things as downpipes, windows, doors, adjoining fences/gates and gas cylinders.
2. In areas that have a reticulated gas service, the gas meter is usually installed in the space below the electricity enclosure, in which case the preferred location for the NTD is at least 150 mm to the left or right of the electricity enclosure and at the same height as the electricity enclosure (usually about 1200 mm from finished ground level). In pre-wiring situations, if the NTD is to be located beside the electricity enclosure it will be necessary to ascertain the location of downpipes, doors, windows, adjoining fences, etc. from the building plan to determine which side of the electricity enclosure to install the NTD and the building entry conduits.
3. If the NTD requires an earth connection for surge suppression purposes (refer to 5.2), this should be made directly to the electrical earth electrode if it is accessible; otherwise, a suitable bonding conductor must be provided by the electrician from the main earthing bar of the electrical switchboard in accordance with Australian Standard AS/CA S009 (wiring rules).
4. Where another external connection box is installed (e.g. for coaxial lead-in cable), the NTD should be positioned at least 50 mm away from the nearest part of the other connection box (measured with the cover of the NTD and the other box closed) even if the same lead-in conduit will be used to pull in the separate lead-in cables. For details, refer to Telstra Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes*.

Figure 14 NTD access clearances

(a) Side and front view (adapted from Figures D1 and D2 of AS/CA S009:2013)



(b) Plan view (adapted from Figures D1 and D3 of AS/CA S009:2013)



Notes:

1. The 150 mm clearance around all sides of the NTD provides space for opening the cover and installing cables.
2. A 300 mm side clearance in front of the NTD provides sufficient “shoulder room” for working on the NTD. The minimum required total clearance width in front of the NTD is 900 mm.

5.4.4 NTD located away from the customer's building

If requested by the customer, Telstra may agree to install the NTD on a pole, fence or other permanent structure within the customer's property. Such cases are regarded as exceptional and Telstra does **not** authorise a cabling provider to install a Telstra NTD at any point **away** from the customer's building. However, if requested to do so by the customer, a cabling provider may install customer cabling ready for connection to a Telstra NTD at a suitable point away from the building (such as a fence, pole or detached garage) on the understanding that Telstra is not obliged to, and may not agree to, connect its lead-in cabling to an NTD so located.

Notes:

1. Installation of the NTD away from the building may prevent or reduce adaptability of the installation to FTTP (Fibre To The Premises). With FTTP, the optical fibre lead-in cable must be provided all the way to the building.
2. Where the NTD is not located at the building, the customer will assume liability for facilities that Telstra would otherwise install and maintain, namely the underground or aerial cabling to the building and any Customer Lightning Protection (CLP) required at the building. For this reason, Telstra is cautious about such decisions being made by a third party (e.g. a builder or cabling provider).
3. Telstra may require the customer (i.e. the occupant) to formally agree to accept responsibility for the customer cabling before Telstra will install, or connect lead-in cabling to, a Telstra NTD located away from the building.
4. The NTD shall **not** be located on public or third party property (e.g. on a footway or in a neighbour's property).

Circumstances where the customer may require the Telstra NTD to be located near the property entry point include, but are not limited to the following:

- due to site cabling difficulties (e.g. terraced gardens, steps, etc.) between the property boundary and the building;
- to enable the use of aerial cabling between the property boundary and the building in areas where Telstra requires its cabling to be installed underground;
- to enable the use of private poles for aerial cabling between the property boundary and the building (for safety reasons, Telstra won't install its cabling on private poles);
- to enable common (customer-provided) conduits, pits or cables to be used for connection of Telstra network services as well as for intra-premises communications such as a gate intercom (Telstra will not allow its lead-in conduits, pits or cables to be used for customer cabling purposes).

Where the network boundary (i.e. the NTD) is not located at the customer's building, Australian Standard AS/CA S009 (wiring rules), requires the cabling provider to:

- assess the need for surge suppression at the building for the protection of the end-user in accordance with Australian Standard AS 4262.1; and
- where the risk of injury due to lightning-induced overvoltage's is assessed as high based on the criteria of Section 3 of AS 4262.1, install surge suppression at the building in accordance with Sections 4 and 5 of AS 4262.1 and the relevant requirements of AS/CA S009.

5.5 Building entry conduits

For building entry conduit arrangements, refer to Telstra Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes*.

5.6 Fastening the NTD to the wall

5.6.1 General

The NTD shall be fixed to a vertical surface with the cable entry ports at the bottom.

The NTD shall **not** be mounted:

- on the eaves/soffit or any other horizontal surface;
- on the building fascia or bargeboard; or
- sideways or upside down.

5.6.2 Conduits

Where conduits are used to support or protect cables running to the Telstra NTD, certain minimum clearances must be maintained between the ends of the conduits and the Telstra NTD. This is important for any conduits that run underground to ensure that any water or moisture coming out of the conduit can escape externally and to enable any termite activity to be visible to a pest inspector. Refer to Figure 15.

Separate conduits shall be used for lead-in cables and customer cables except where otherwise permitted in this Document (e.g. for NTD retrofit — see 5.13).

The end of any conduit that runs underground to/from the building shall **not** be covered by the base of the NTD.

Note: Surface conduit may butt up to the bottom of the external tie facility as shown in Figure 15 (b), which will provide the required gap between the end of the conduit and the cable entry hole.

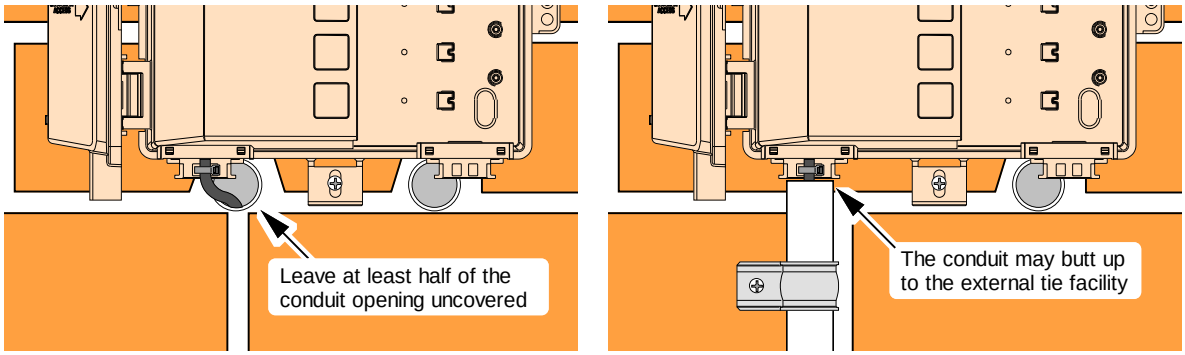
Other conduits (e.g. running down from the eaves) may butt up to the NTD; however, enough space must be left between the end of the conduit and the NTD to open and close the cover. Corrugated (semi-rigid) conduit may be used above ground on the surface of the wall as long as the conduit is a UV-stabilised type.

Where the building is being pre-wired for a Telstra NTD, any conduits concealed in the wall cavity for the lead-in cabling and the customer cabling should be spaced in accordance with Figure 16.

Note: Building entry conduit arrangements are described in more detail in Telstra Document No. 017153a02, *Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes*, which may be accessed under the “Builders” menu of the Telstra Smart Community website (http://www.telstra.com.au/smart-community/builders/).

Figure 15 NTD spacing from underground lead-in conduit

(a) Concealed lead-in conduit (Note 1) **(b) Surface lead-in conduit (Note 2)**

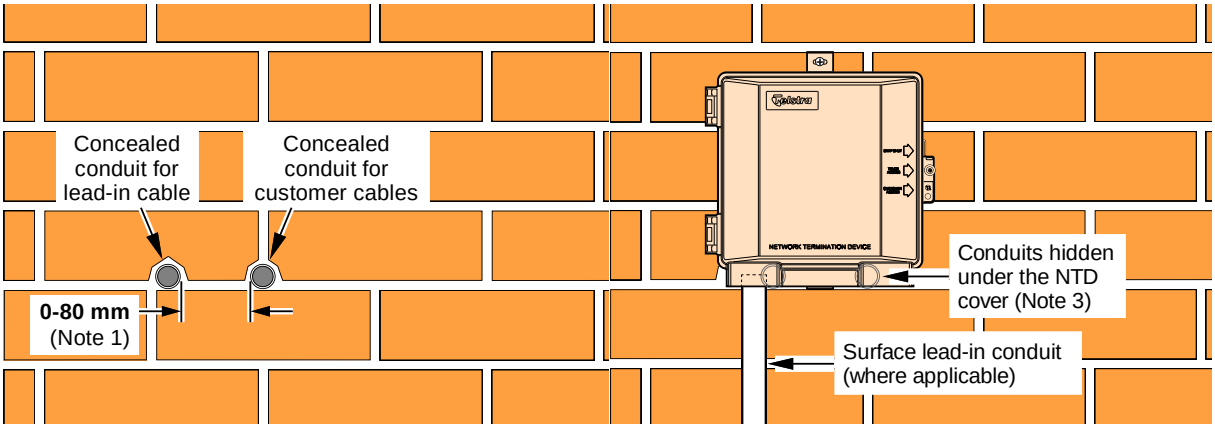


Notes:

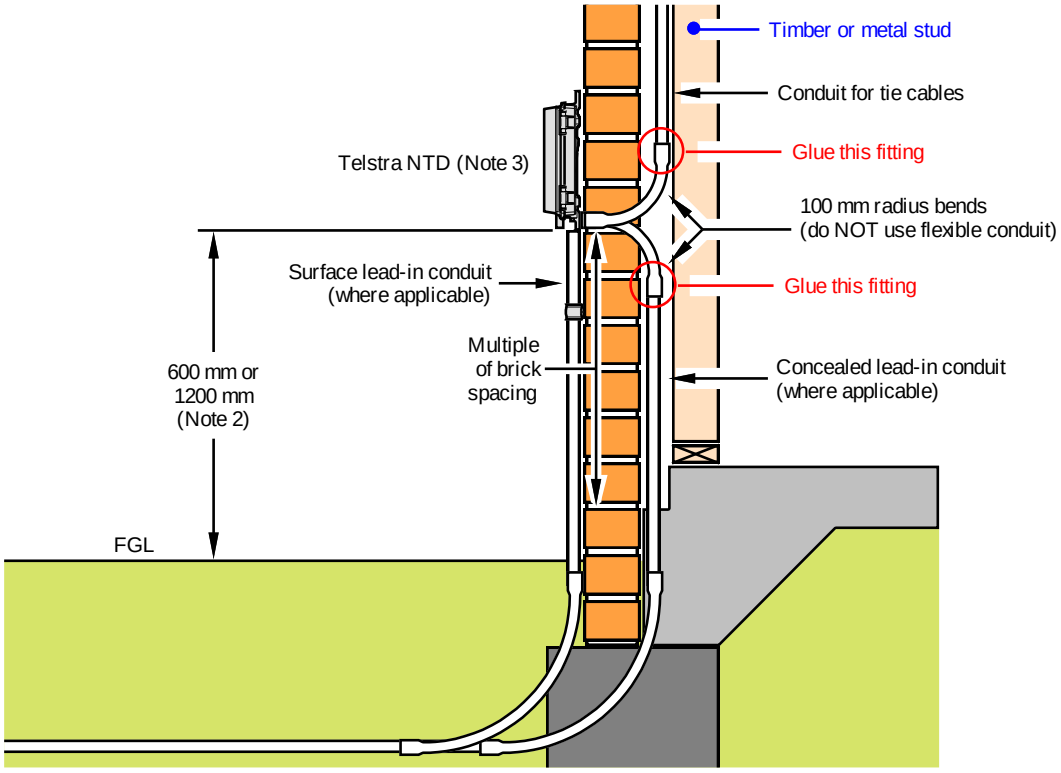
1. The end of any concealed lead-in conduit shall **not** be covered by the base of the NTD.
2. Surface lead-in conduit shall terminate 10 mm to 20 mm short of the cable entry hole. This will be achieved if the end of the conduit butts up to the external cable tie facility.
3. Where surface Telstra 50 mm conduit has been used for the lead-in cabling, terminate the conduit no less than 5 mm and no more than 20 mm below the lowest extremity of the NTD cover.

Figure 16 Conduit positioning where a combined utilities enclosure (CUE) is not used

(a) Conduit spacing **(b) Front view of an installed Telstra NTD**



(c) Side view of the completed NTD installation



Notes:

1. While conduit positioning is not critical, correct orientation and spacing will simplify installation of the NTD. The optimal conduit spacing for the Telstra NTD is 113 mm (143 mm centres) but spacing the conduits between 0 mm and 80 mm as shown in (a) above (80 mm is recommended) will ensure compatibility with future FTTP wall boxes.
2. For pre-wiring, locating the NTD below the electricity enclosure will reduce the risk of obstruction by fences, downpipes, etc. Positioning the conduits 600 mm above finished ground level (FGL) will ensure sufficient clearance from the electricity enclosure with reasonable NTD height for access. However, for an existing home (or for a new home where there is, or will be, a gas meter), the NTD should positioned beside the electricity enclosure (about 1200 mm above FGL).
3. The NTD shall be positioned above any conduit that runs underground to/from the building in accordance with Figure 15, to ensure that water and vapour can escape from the conduit and to enable the conduit opening to be readily inspected for termite activity by a pest inspector.

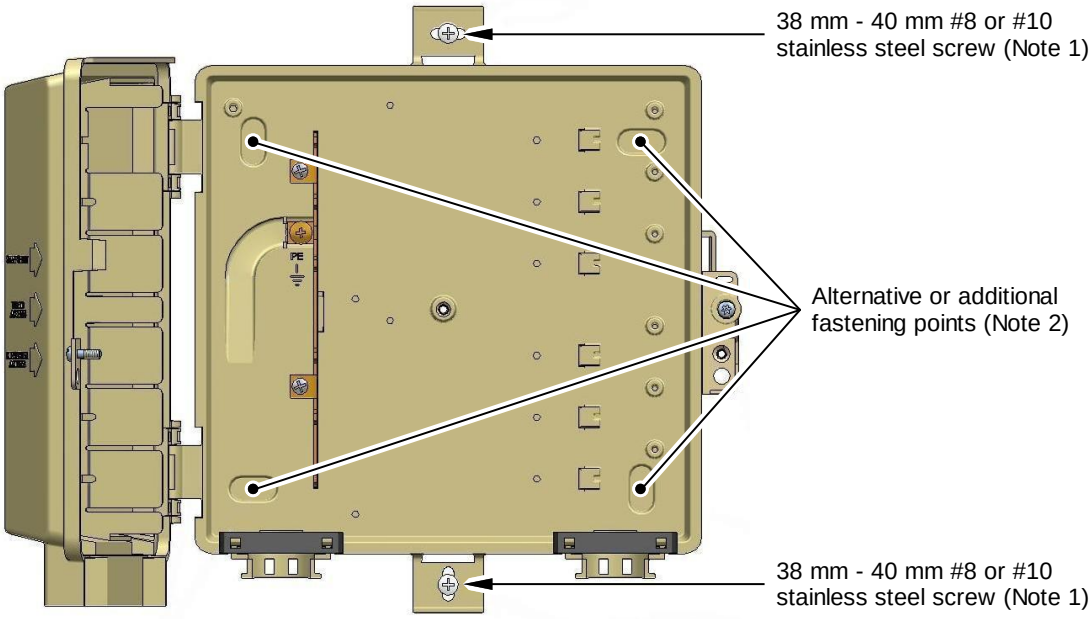
5.6.3 Fastenings

The NTD shall be fastened to the wall in accordance with Figure 17.

Impact fasteners shall **not** be used to affix the NTD.

Note: This is to ensure that the NTD can be easily removed at some later time to facilitate rodding of the lead-in conduit, access to any cables behind it, or to replace the NTD for repair or upgrade.

Figure 17 Fastening the NTD to the wall



Notes:

1. The NTD shall be affixed using 38 mm to 40 mm no. 8 to no. 10 stainless steel screws through the external mounting tabs at the top and the bottom of the base (use expanding plugs in masonry walls) unless sufficient hold cannot be obtained using these mounting holes, in which case the internal mounting holes may be used.
2. Where the internal mounting holes are used, at least two diagonally opposed, 25 mm to 30 mm, no. 8 to no. 10 countersunk head, stainless steel or zinc-plated steel screws shall be used (use expanding plugs in masonry walls). Drill holes no larger than 4 mm (5/32") diameter through the mounting depressions in the base of the NTD so that the countersunk head screws will seal the holes against the ingress of any water running down the wall.

5.7 Fitting the line modules

The NTD is supplied as an empty enclosure. Three connection modules are available separately (see Table 1):

- **Line module, DSL, MT2711** (with integrated DSL central filter)
  This module should be used if the home or small business has been cabled for an outdoor central filter (e.g. using separate cables for phone and DSL services).

  Note: The module is suitable for connection of a telephone service and an ADSL, ADSL2 or ADSL2+ service.
- **Line module, standard, MT2712**
  This module should be used where an outdoor central filter is not required or where the central filter will be installed on the customer side of the NTD (see 5.3.2 on page 17).
- **Line module, rural, MT2713**
  This module is used by Telstra for connection of 10-pair rural lead-in cable. It is required in addition to the line modules described above. It takes up 3 line module positions such that a maximum of 3 lines may be connected within the NTD (see Figure 23 on page 36). Cabling providers are **not** authorised to install this module.

One line module (MT2711 or MT2712) is required for each working lead-in pair. The modules should be installed from the top down (i.e. first line module at the top of the enclosure, last line module at the bottom of the enclosure) unless any of the cables to be connected to the module won't reach, in which case the module may be installed in a lower position to avoid the need for joining the cable conductors.

A lead-in cable pair shall **not** be connected to a customer cable pair without the use of a line module (MT2711 or MT2712) under any circumstances.

To install line module MT2711 or MT2712, engage the foot of the module under the claw on the right hand side of the NTD base and push the left side of the module down onto the tongue of the earthing bar. Then break off the corresponding tab in the Telco access cover using your fingers or pliers (see Figure 22 on page 35).

5.8 Cable entry

5.8.1 Physical protection of cables

Lead-in cables that run on the external surface of the building to the NTD shall be enclosed in conduit unless otherwise protected from physical damage.

Customer cables that run on the external surface of the building to the NTD shall be enclosed in conduit unless they are otherwise protected from exposure to sunlight or they are outdoor type cables (e.g. with a black polyethylene sheath).

Where possible, leave about 500 mm of slack cable in the combined enclosure, wall cavity, eaves cavity or roof space, as applicable, to allow the NTD to be unfastened and pulled away from the mounting surface with the cables and connections intact.

Note: This is to facilitate access to the lead-in conduit or building entry hole for cable replacement or for drawing in additional cables. Do not leave excess slack in the wall cavity as this may cause tangling or knotting or prevent formation of an effective drip point inside the cavity.

5.8.2 Cable entry ports

The NTD has two cable entry ports — one for lead-in cables and bonding/earthing conductors, and one for customer cables (see Figure 18). Lead-in cables and any bonding/earthing conductors shall enter the left cable entry port and customer cables shall enter the right cable entry port.

Holes shall **not** be drilled in the top, side or rear of the NTD for cable entry. Cables shall enter the bottom cable entry ports **only**. Under **no** circumstances shall:

- any lead-in cable or bonding/earthing conductor be run through the right-side cable entry port; or
- any customer cable be run through the left-side cable entry port.

Note: Where any cable runs to the top, side or the wrong cable entry port of the NTD, run the cable behind or below it to the cable entry ports at the bottom, as shown in Figure 19 (page 32).

Rubber grommets are provided in the cable entry ports to inhibit the entry of insects. Cut an “asterisk” in the grommet along the cutting guides impressed into the grommet using a sharp knife or diagonal cutters. Carefully thread the cables through the puncture so as to minimise any gaps between the cables and the grommet. Extra sealing of the cable entry against the ingress of ants in troublesome areas (e.g. Northern Australia) may be required. In such cases, knead grey sealant tape (Telstra material no. 51300059) into the voids on both sides of the grommet.

The cable entry grommets shall **not** be removed.

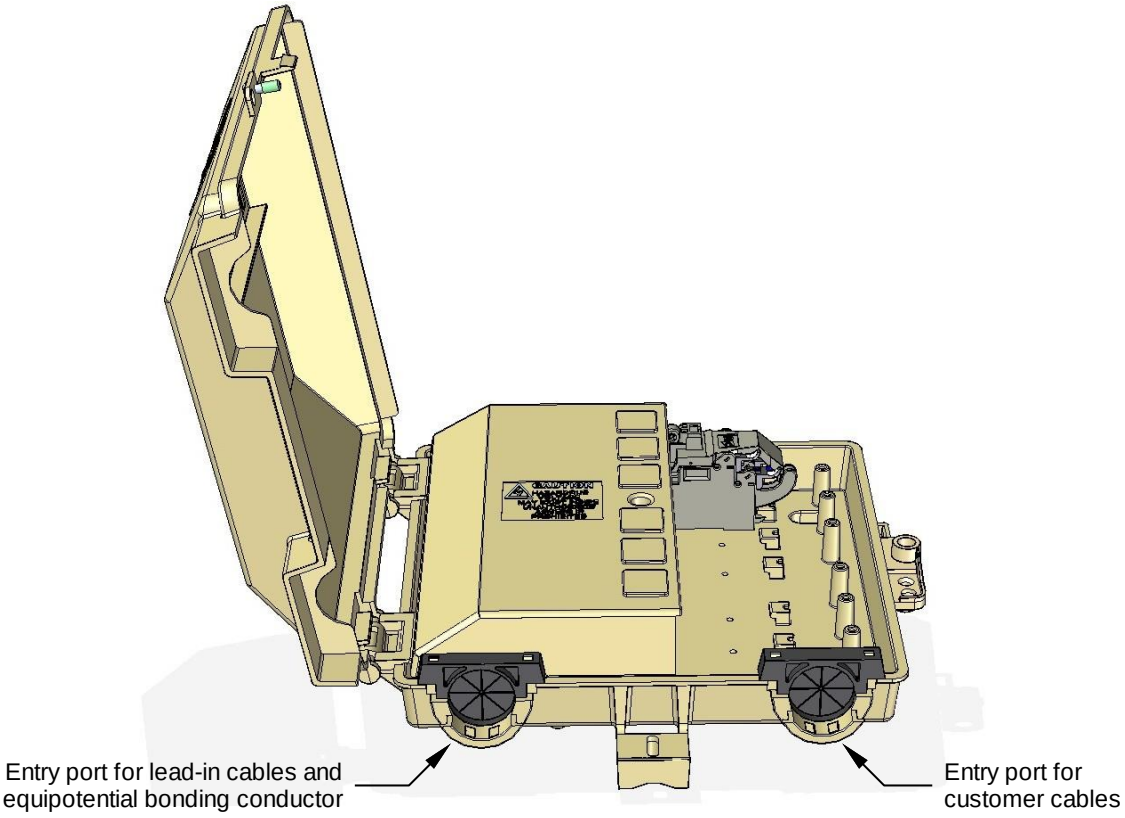
Conduit of any size shall **not** penetrate the rubber grommet. Conduit used for aerial or indoor cables shall terminate at least 5 mm short of the grommet to reduce the risk of water vapour from the conduit entering the NTD to form condensation inside it.

5.8.3 Cable ties

The NTD has external tie facilities large enough to tie both cable and conduit. While the end of any conduit that runs underground to/from the building must stop 10 mm to 20 mm short of the cable entry hole, conduit used for aerial or indoor cables may butt up to within 5 mm of the cable entry grommet and may be tied to the external tie facilities. Tie the cables (or conduits if applicable) to the external tie supports using weather-resistant cable ties.

Underground lead-in cable emerging from the conduit at the NTD shall be tied to the external tie facility to prevent it falling back down the conduit. Do not over tighten the cable tie. Refer to Figure 22 on page 35.

Figure 18 Cable entry to the NTD

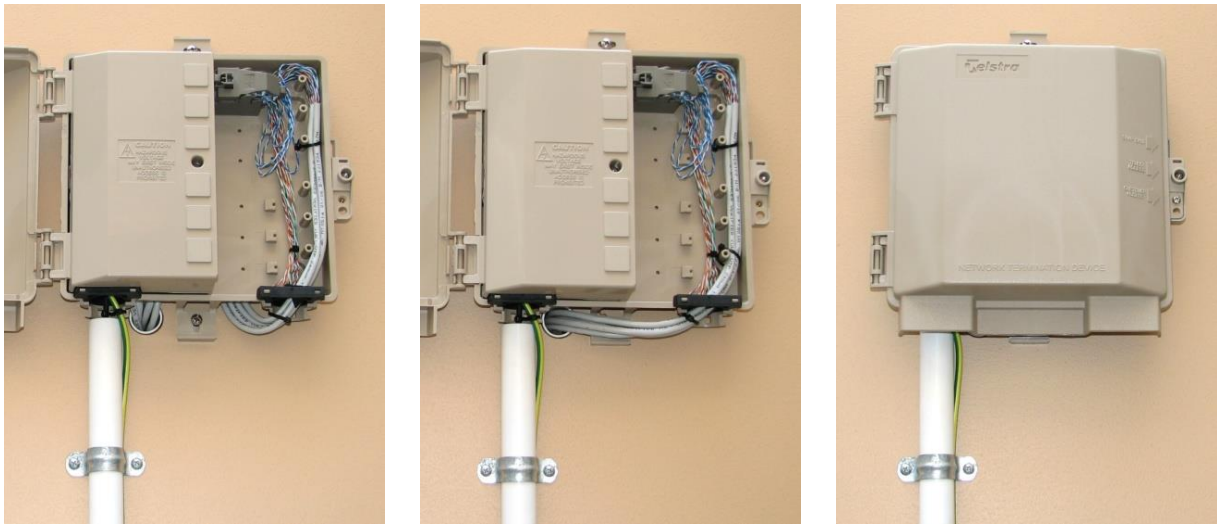


Notes:

1. Surface lead-in conduit shall terminate 10 mm to 20 mm short of the cable entry hole (it may butt up to the bottom of the external tie facility as shown in Figure 15 on page 28). Corrugated conduit for aerial or indoor cables may be tied to the external tie facility about 5 mm short of the cable entry grommet.
2. Tie the cables or conduits, as applicable, to the external cable tie facilities.

Figure 19 Running cable behind or below the NTD to the cable entry port

Cables running behind the NTD **Cables running below the NTD** **Cables hidden by the cover skirt**



Note: If the lead-in and customer conduits are next to each other, either the lead-in cable or the customer cable may be run behind or below the NTD to the appropriate cable entry port, as in the examples shown above. Either way, the skirt on the NTD cover will hide the cables from general view and protect them from exposure to sunlight. Cables running to the top of the NTD shall run behind the NTD to the cable entry, as indicated at the far left.

5.9 Connection of cables

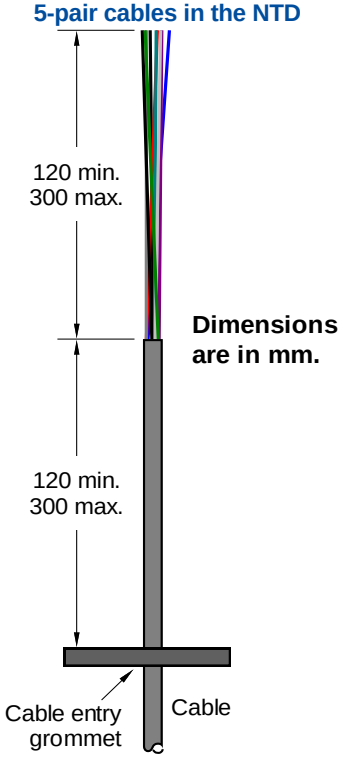
5.9.1 Cable preparation

To support future moves and changes, 120 mm to 300 mm of cable sheath and 120 mm to 300 mm of insulated conductor should be provided within the NTD up to the termination on the line module.

To prepare the cable for connection within the NTD, strip the cable sheath at least 120 mm above the cable entry hole and trim the conductors to a length of at least 120 mm beyond the end of the cable sheath, as shown in Figure 20.

Note: Sufficient slack cable may not be available to do this where an NTD is being provided on an existing installation. In such cases, as much slack cable as possible should be provided within the NTD.

Figure 20 Preparation of 2-pair to 5-pair cables in the NTD



5.9.2 Cable termination rockers

All line modules use gel-filled insulation displacement connectors that do not require the use of any tools. These have a lever action and are referred to as “rockers”.

Each rocker will terminate one pair of 0.40 mm to 0.64 mm diameter solid copper conductors. They are not suitable for connection of 0.90 mm diameter conductors or stranded conductors.

Any cable with larger conductors (e.g. 0.90 mm diameter) shall be joined to 0.40 mm or 0.64 mm cable first, using suitable moisture resistant connectors (see Figure 36 on page 49), and then the 0.40 mm or 0.64 mm cable is to be terminated on the NTD line module. Most Telstra lead-in cables have 0.40 mm or 0.64 mm diameter conductors whereas most indoor type cables have 0.50 mm diameter conductors. Any stranded conductors shall be soldered to 0.40 mm or 0.64 mm solid copper conductors first and then the solid insulated conductors may be terminated on the module rockers.

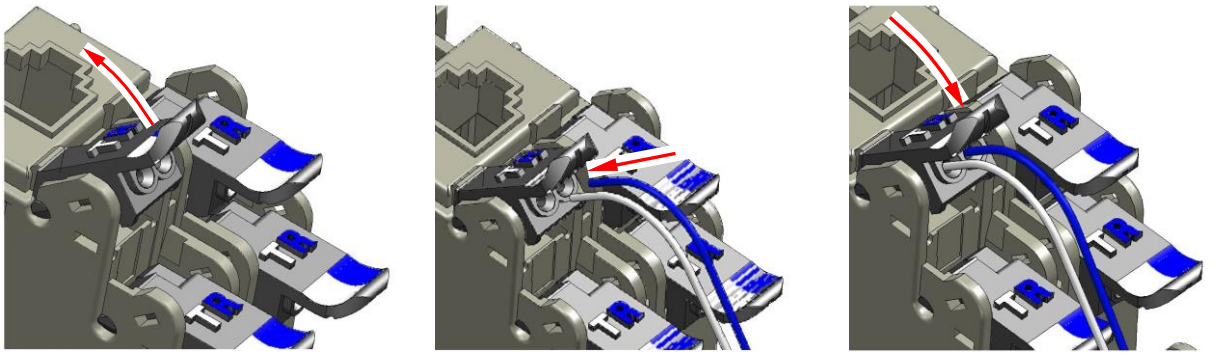
Do not strip the insulation from the conductors. To terminate a pair of conductors, simply lift the rocker with your finger, push the insulated conductors into the two holes in the rocker as far as they will go, then push the rocker back down firmly. The coloured conductor (“B” leg) goes into the hole marked “R” (blue) and the mate (“A” leg) goes into the hole marked “T” (white). See Figure 21.

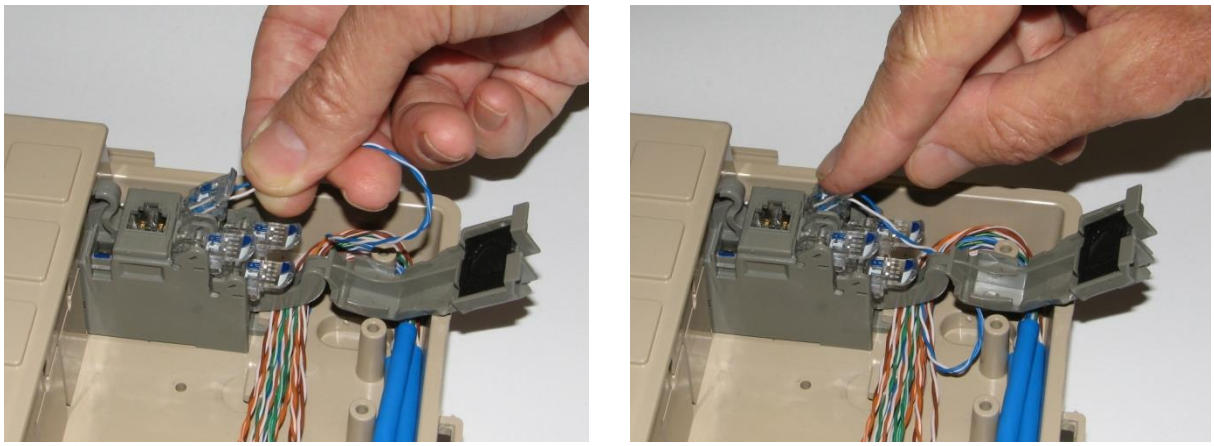
Note: “T” and “R” stand for “Tip” and “Ring”, which is a legacy from the corded telephone switchboard era when the leg of each line was designated according to whether it connected to the “tip” or the “ring” of the concentric connecting plug. These designations are used widely in the USA from where the line modules originated.

After terminating the conductors, visually inspect the connection through the transparent rocker and check that the conductors are inserted for the full length of the rocker.

Figure 21 Connection of cable conductors to the line module rockers

Lift the rocker **Insert the conductors** **Close the rocker**





5.9.3 Connection of the lead-in cable and bonding/earthing conductor

5.9.3.1 Bonding/Earthing conductor

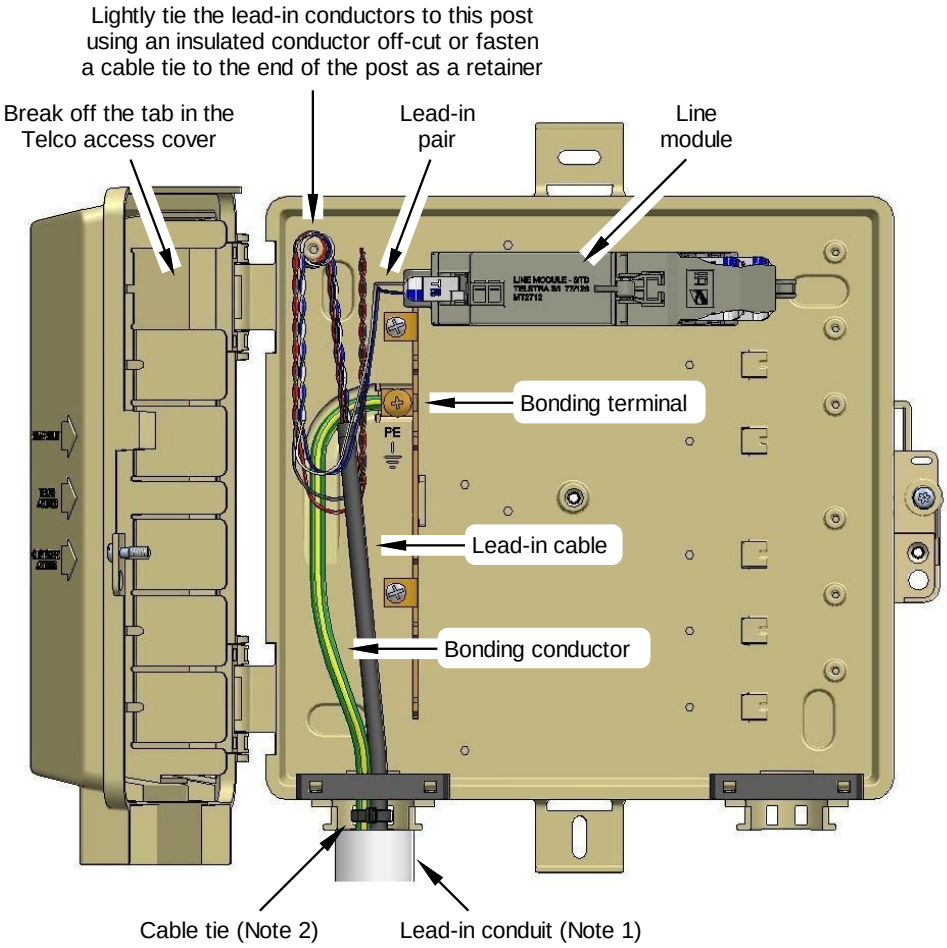
If an equipotential bonding (earthing) conductor is provided, connect this to the “bonding terminal” (this is the screw terminal marked “PE” on the earthing bar — see Figure 22). To connect the bonding/earthing conductor, strip 10 mm to 12 mm of insulation from the conductor, consolidate the conductors by twisting the strands tightly together with pliers, seat the bared conductors in the “V” section of the earthing terminal and fasten the screw. Form the bonding/earthing conductor into the curved recess in the base.

Do **not** put a loop or gooseneck in the bonding/earthing conductor but try to leave a little slack conductor (no more than 200 mm) in the conduit or wall cavity.

5.9.3.2 Urban lead-in cable

Prepare the lead-in cable in accordance with Figure 20. Loop the cable pairs around the post at the top left of the NTD enclosure and lightly twist them together or tie them together using an insulated conductor off-cut. Ensure that spare pairs won’t get jammed under the cover. Connect the cable pair to the Telstra side of the line module, as described in 5.9.2 and shown in Figure 22.

Figure 22 Connection of 2-pair or 5-pair PE or PEHJC lead-in cable



Notes:

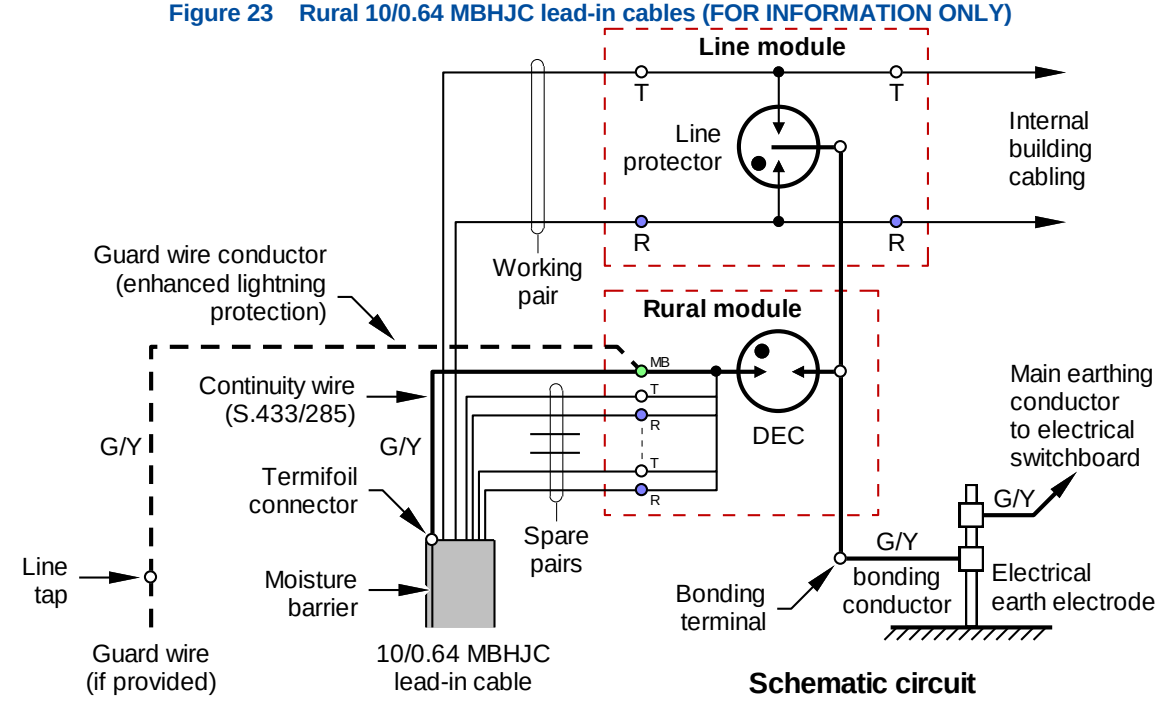
1. The lead-in conduit shall terminate at least 10 mm short of the cable entry grommet. This will be achieved if the conduit butts up to the bottom of the cupped cable tie support as shown above (the conduit may terminate up to 10 mm below the cable tie support).
2. Tie the lead-in cable and bonding/earthing conductor (where provided) to the external cable tie support using weather-resistant cable ties. **Do not over tighten the cable tie.**
3. Connect the conductors to the module rocker as described in 5.9.2.

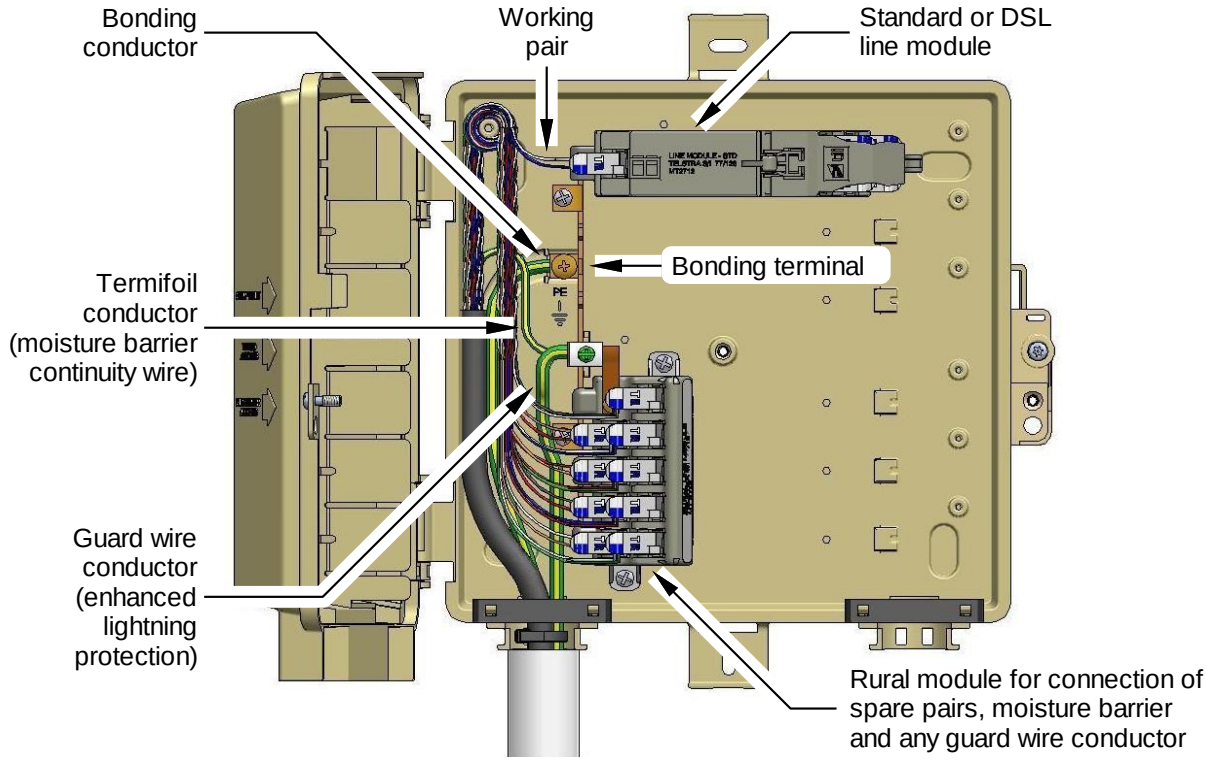
5.9.3.3 Rural lead-in cable

If a 10-pair MBHJC rural lead-in cable is installed, the spare cable pairs, “termifoil” conductor and any guard wire conductor must be connected to a rural cable connection module MT2713 as shown in Figure 23.

This is provided for information only. Cabling providers are **not** authorised to install, connect, disconnect, replace, or otherwise interfere with, this module. A cabling provider is, however, authorised to replace an existing line module with another line module in accordance with 4.4.4 (c) or (d).

Figure 23 Rural 10/0.64 MBHJC lead-in cables (FOR INFORMATION ONLY)





Notes:

1. The rural module should be fitted in the lower part of the NTD as shown but may be fitted to the upper part if necessary (e.g. if some of the customer cables won't reach a line module fitted at the top of the NTD).
2. Up to 3 line modules may be installed with the rural cable connection module fitted. These should normally be fitted from the top down.

5.9.3.4 Connection of customer cables

Refer to 4.2.2 (page 9) for NTD cable capacity limitations.

To connect a cable on the customer side of the NTD, prepare the cable in accordance with 5.9.1. Lay the sheathed cable(s) between the right hand side of the enclosure and the posts protruding from the base. Loop the insulated conductors around the uppermost post that will allow the conductors to be terminated on the relevant rockers on the line module. See Figure 24. Connect the cable pairs to the customer side of the line module rockers as described in 5.9.2.

Customers may access this side of the NTD, so it is important that the conductors are tied and tucked out of harm's way so the customer doesn't get jabbed by the end of a stray conductor and conductors won't get jammed under any hinges or covers.

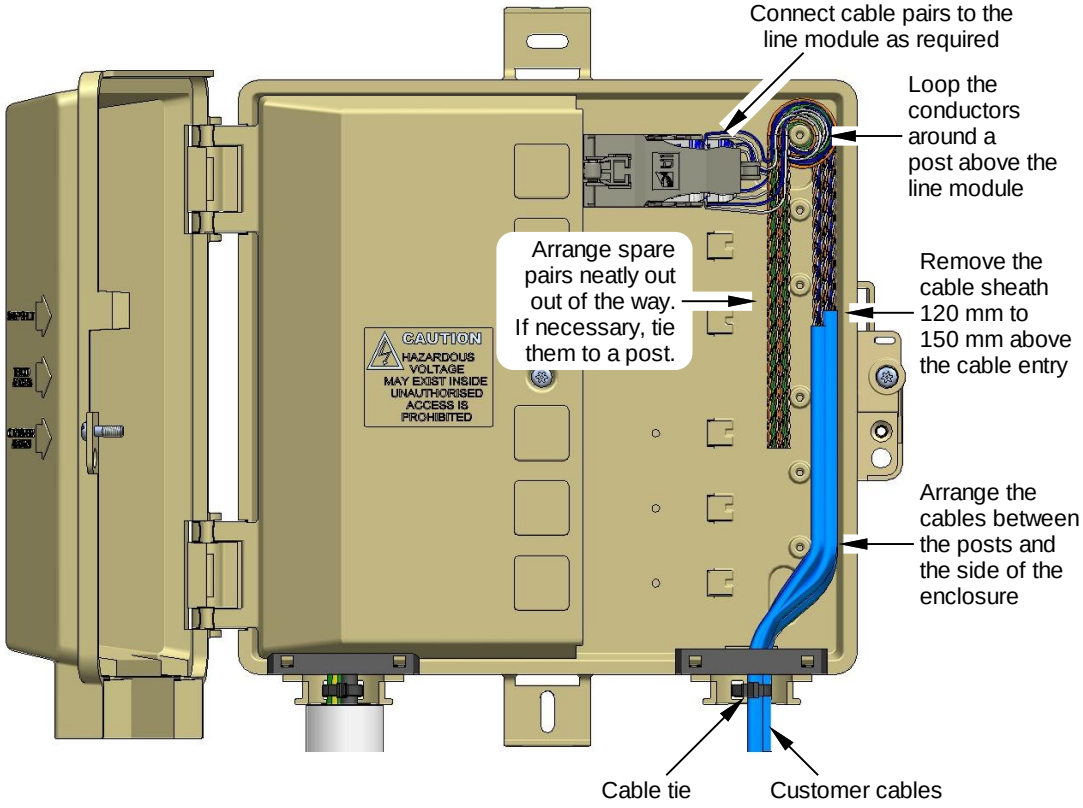
Refer to 5.9.4 and 5.9.5 for typical cable connection arrangements.

5.9.3.5 Stranded conductors

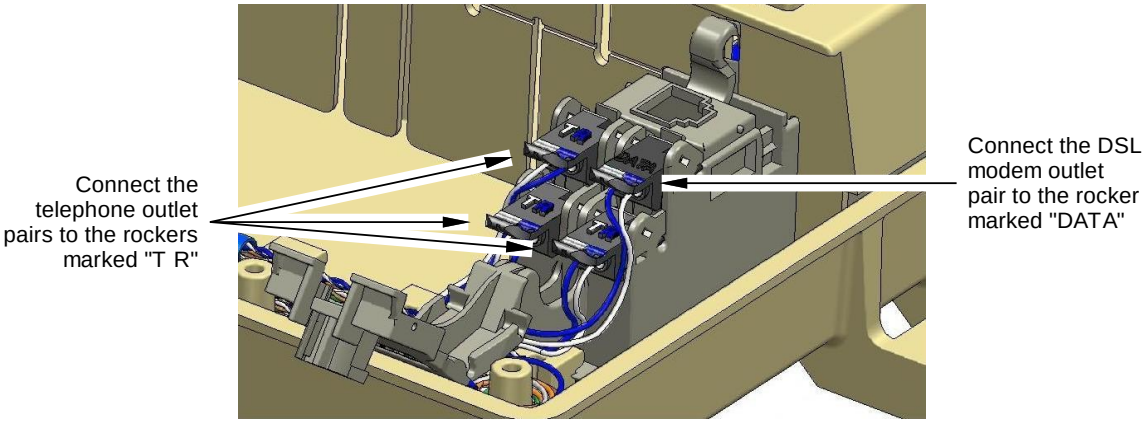
Stranded conductors cannot be reliably terminated on the line modules.

Note: Many cables with stranded conductors are designed for security cabling or other non-voice applications and may not have the required pair twist to prevent crosstalk or interference to/from other services. Such cables should be replaced with solid copper, twisted pair cables. If there is a legitimate reason for using a cable with stranded conductors and it has twisted pairs, the stranded conductors will need to be soldered to 0.40 mm to 0.64 mm solid copper conductors and the solid conductors may then be terminated on the line module in accordance with 5.9.2.

Figure 24 Connection of customer cable
(a) Arrangement of customer cables



(b) Connection of DSL and telephone pairs (if a DSL line module is used)



Notes:

1. Prepare the cables in accordance with 5.9.1. Tie the cables or conduit to the external cupped cable tie support using weather-resistant cable ties. **Do not over tighten any cable ties used to secure the cables.**
2. Position the cables between the right hand side of the enclosure and the posts protruding from the base. If necessary, tie the cables to the posts or use a no. 6 self-tapping screw to secure a cable guide or retainer to the posts. Loop the conductors around the uppermost post that will allow the conductors to be terminated on the relevant line module.
3. Connect the conductors to the module rockers as described in 5.9.2. With the DSL line module, the DSL pair connects to the rocker marked “DATA” and up to three telephone outlet pairs may be connected to the three rockers marked “T R”.
4. Refer to Figure 25 to Figure 27 for common cable connection arrangements on the customer side of the NTD.

5.9.4 Star wiring of telecommunications outlets (TOs)

5.9.4.1 General

The standard line module (MT2712) has connection rockers for 4 star-wired TOs.

The DSL line module (MT2711) has connection rockers for 3 star-wired telephone TOs and one rocker for connection of the DSL TO.

Figure 25 shows how star-wired outlets are connected to the **standard** line module where **no "Mode 3"** connection is required.

Figure 26 shows how outlets are connected to the **DSL** line module where **no "Mode 3"** connection is required.

Where a **"Mode 3"** connection is required, see **Figure 27**.

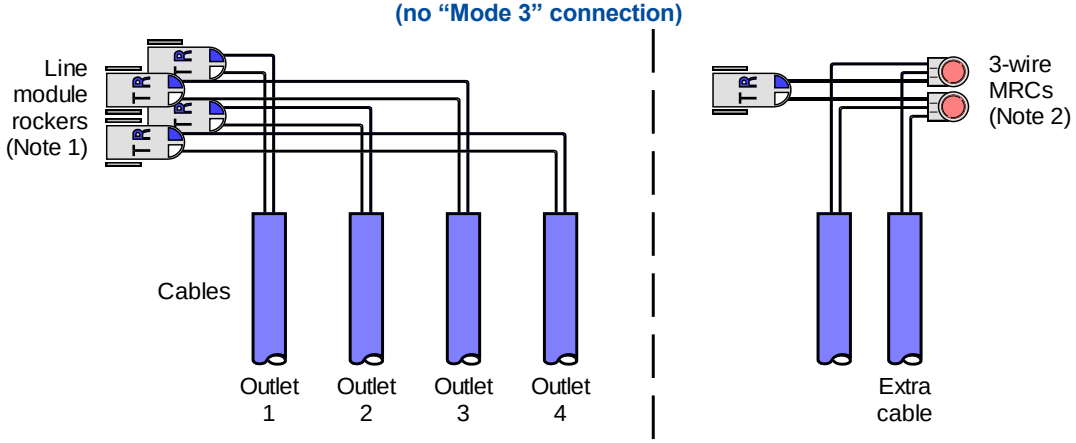
5.9.4.2 VOIP (Voice Over Internet Protocol) connections

Any telephone service pair back-fed to the NTD from a VOIP modem shall **not** be connected to **any** rocker on **any** line module. A VOIP service must be connected to customer cables via a separate star-wiring module (such as the one shown at the bottom of Table 1), which may be mounted in any spare space on the customer side of the NTD.

Notes:

1. It is important that any VOIP connections are isolated from the Telstra network for the safety of the customer and to prevent interference to the Telstra network.
2. Holes are provided in the base of the NTD for mounting separate star-wiring modules. Use no. 6 self-tapping screws for this purpose, ensuring that the length of the screw penetrating the base of the NTD does not exceed 5 mm.

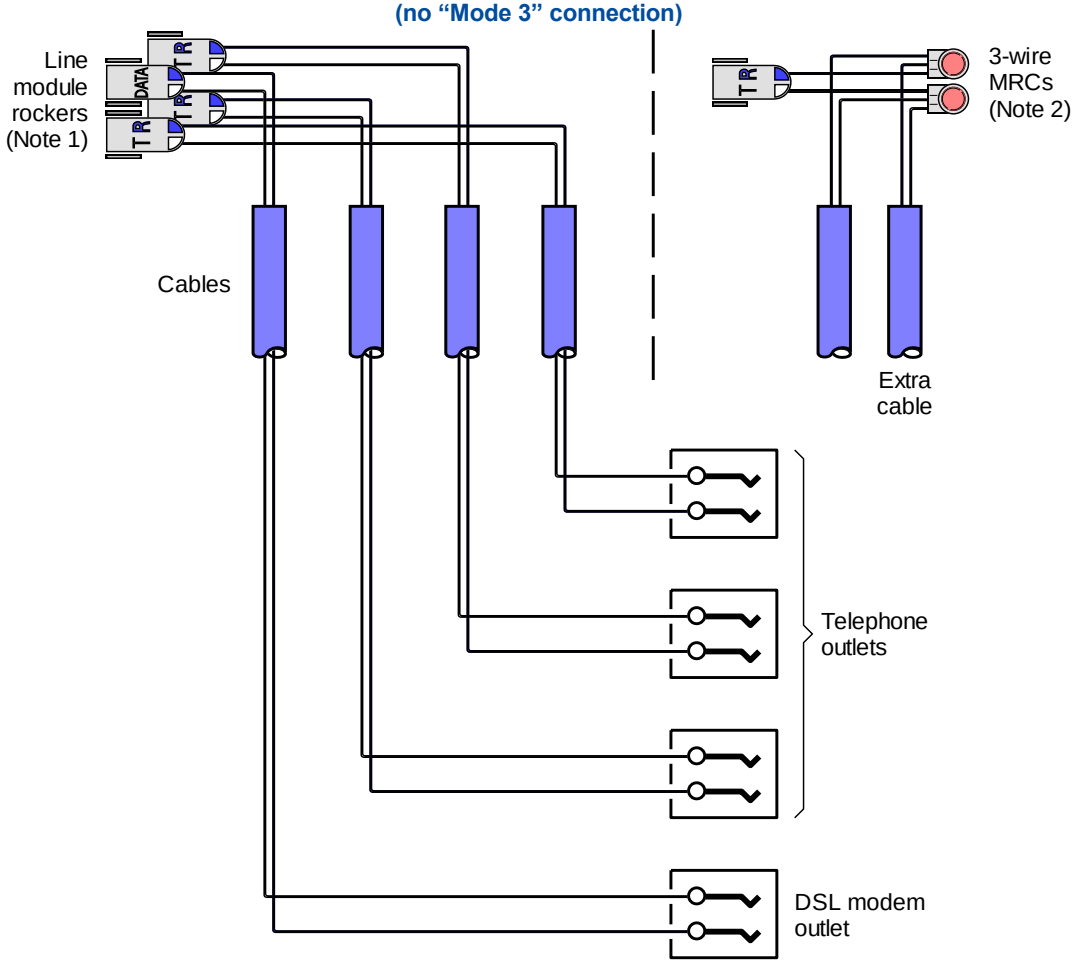
Figure 25 Connection of star-wired TOs on the standard line module MT2712 (no "Mode 3" connection)



Notes:

1. For easier rocker access, connect cables to the rear rockers first, then the front rockers.
2. If more than 4 cables need to be connected to the line module, use 3-wire moisture resistant connectors (MRCs) to connect the extra cables as shown at right.

Figure 26 Connection of star-wired TOs on the DSL line module MT2711 (no "Mode 3" connection)



Notes:

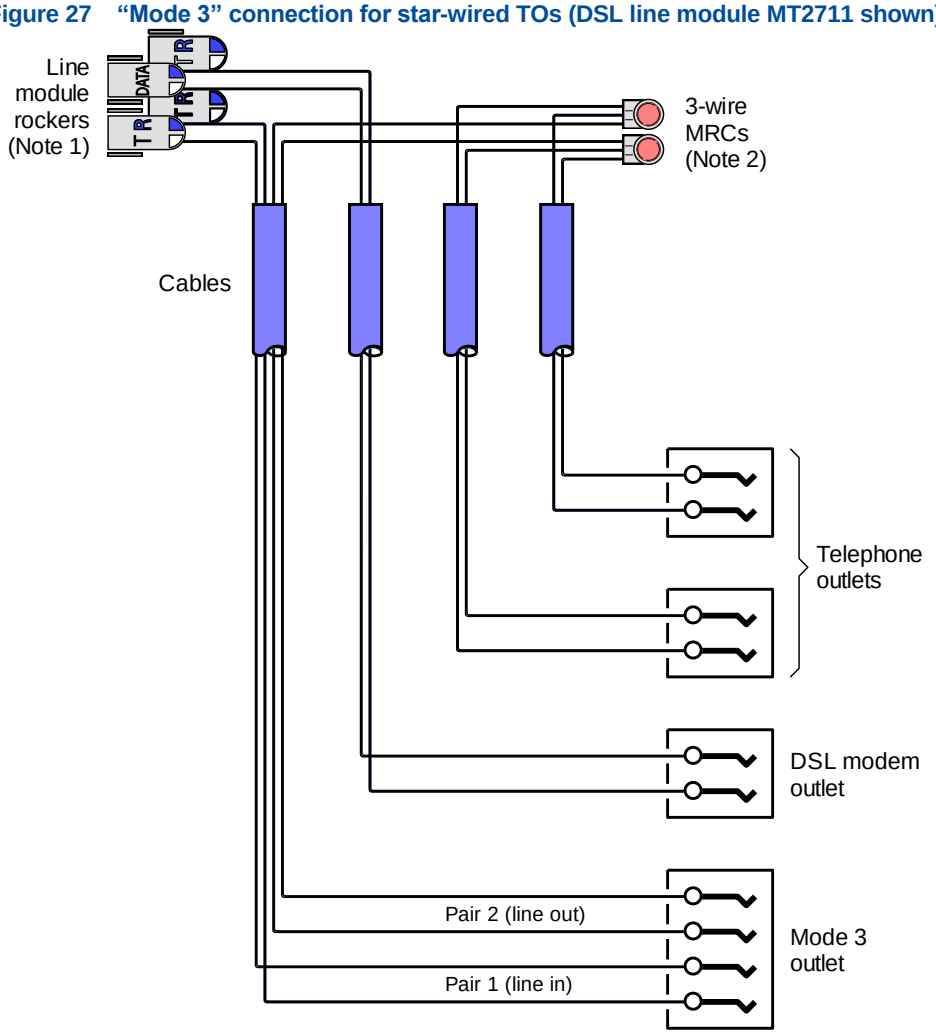
1. For easier rocker access, connect cables to the rear rockers first, then the front rockers.
2. If more than 3 telephone cables need to be connected to the line module, use 3-wire moisture resistant connectors (MRCs) to connect the extra cables as shown at the top right of this drawing.

5.9.4.3 "Mode 3" connections

Many homes have an intruder alarm panel or a personal response (emergency call/medical alert) system that provides for back-to-base monitoring via the public switched telephone network. It is important that such equipment has connection priority over all other telephone equipment. This is achieved by the use of a "line grabber" or "Mode 3" connection arrangement.

Where all TOs are star wired from the NTD, including the TO used to connect the "Mode 3" equipment, connect them in accordance with Figure 27. If the customer has a DSL service, a DSL central filter must be used to provide a DSL service if a Mode 3 connection is required. Where a DSL line module is used for this purpose, the pair for the DSL service is connected to the "DATA" rocker as shown. Alternatively, a separate DSL central filter may be installed on the customer side of the NTD (refer to 5.3 on page 17).

Figure 27 "Mode 3" connection for star-wired TOs (DSL line module MT2711 shown)



Notes:

1. For a standard line module (MT2712), i.e. where a DSL service is not required, simply omit the "DATA" connection.
2. Use 3-wire MRCs to connect the telephone outlet cables to the "line out" pair from the "Mode 3" outlet. Alternatively, use an additional star-wiring module like that shown at the bottom of Table 1. The additional rockers on the line module cannot be used where a Mode 3 connection is required.

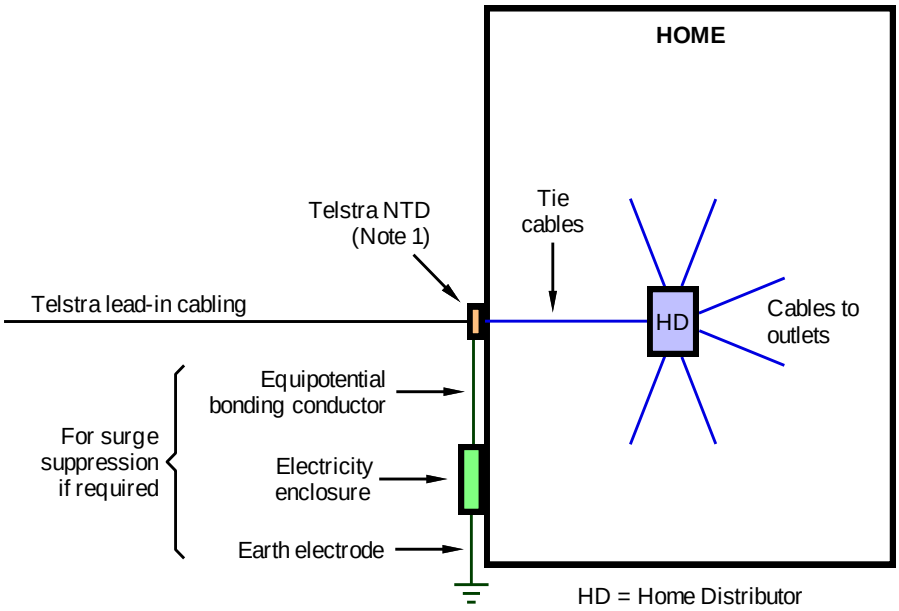
5.9.5 Home networking

If a home networking distributor (e.g. a patch panel) is, or will be, installed, the lead-in cable shall be connected to a Telstra NTD at the building entry point with tie cables running from the NTD to the distributor, in accordance with Australian Standard AS/NZS ISO/IEC 15018, Standards Australia Handbook HB 252 and Telstra Document No. 017153a01, *Cabling of premises for telecommunications — Essential information for home cabling*. This principle is illustrated in Figure 28.

Note: With some multiple dwelling units (e.g. blocks of flats/units and multi-storey buildings), the Telstra lead-in cable will terminate on a customer MDF, with tie cables running from the MDF or the floor distributor to the patch panel. A Telstra NTD shall **not** be used in such cases.

	Telstra lead-in cabling shall **not** be connected to any patch panel unless it meets the requirements for a customer MDF of Australian Standard AS/CA S009, Installation requirements for customer cabling (Wiring rules), and Telstra Document No. 017153a08, Cabling of premises for telecommunications — Telstra requirements for customer MDFs.
Note:	Telstra lead-in cable connecting to a customer MDF must terminate on KRONE modules, and services must be jumpered to similar modules on the customer side of the MDF. The MDF must also meet other requirements set out in AS/CA S009 and Telstra Document No. 017153a08. Telstra lead-in cable must be connected to the MDF by Telstra. Non-Telstra cabling providers are **not** authorised to connect Telstra lead-in cable to any customer MDF.

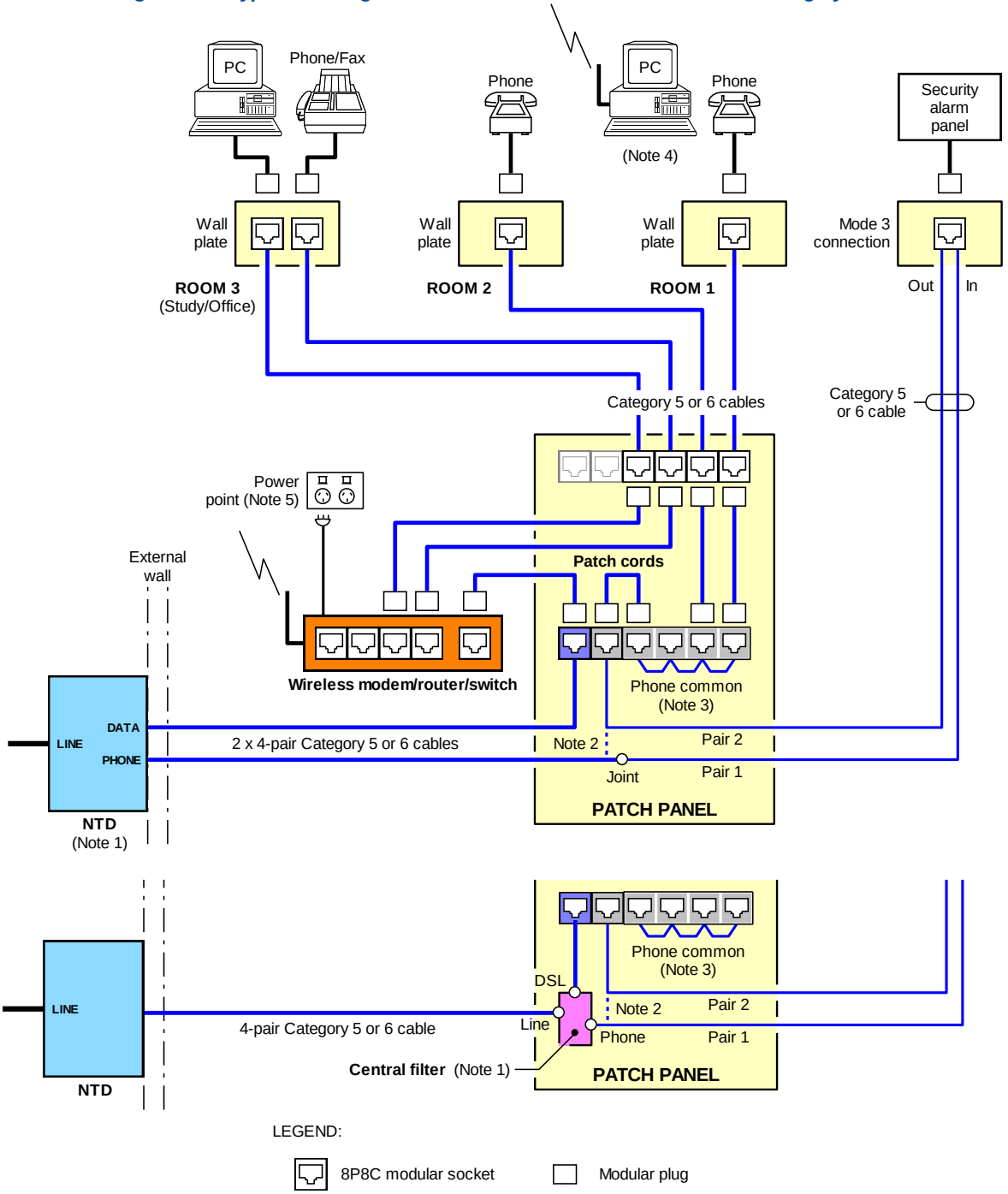
Figure 28 Connection of a home networking system via a Telstra NTD



Notes:

1. The Telstra NTD shall be located on the external wall in accordance with the requirements of 5.4 (page 20).
2. The home distributor (HD) usually contains a patch panel that enables customers to change service and telecommunications outlet connections to meet their particular requirements. See Figure 29.
3. Telstra lead-in cable shall **not** be connected directly to any HD unless it meets the requirements for a customer MDF (see the above text). Telstra lead-in cable must be connected to an MDF by Telstra.

Figure 29 Typical cabling and connections for a basic home networking system



Notes:

1. The DSL central filter may be located in the NTD as shown in the main diagram above or, alternatively, a central filter may be installed at the patch panel location as shown in the variation below it.
2. If a “Mode 3” connection is not required, connect the “Phone” pair directly to the “Phone” socket in the patch panel. Refer to Telstra Document No. 017153a00 for other “Mode 3” wiring options at patch panels.
3. Only the first pair of contacts (4 and 5) for each of these sockets should be commoned.
4. Wireless (Wi-Fi) PC networking or cordless telephones can be used to supplement wired networking of devices.
5. At least one 230 V double power point should be provided within 1 metre of the patch panel for powering of the DSL modem/router and, at some time in the future, an FTTP optical network terminal.

5.10 Securing the NTD cover

Check that no cables or conductors will be jammed between the Telco cover and the base, and tighten the Telco cover screw using the “Torx” security tool described in Table 1.

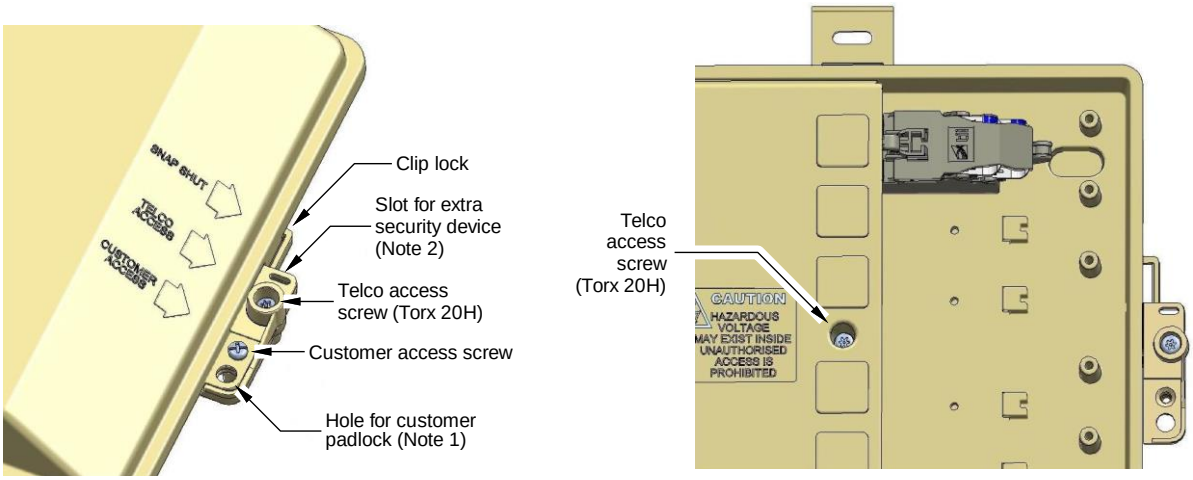
To ensure that the customer cannot access the bonding/earthing terminals or any Telstra network devices, the Telco cover shall **not** be left unsecured under any circumstances.

Ensure that all customer cables and conductors are safely arranged out of the way of the test socket area on the customer side of the NTD, and then snap the main cover shut. Ensure that both the standard and Torx cover screws are tightened.

Refer to Figure 30.

Figure 30 Telstra NTD cover latch and securing screws

Customer access cover latch and screws **Telstra access cover screw**



Notes:

1. The Telco access screw (Torx 20H) on the main cover may be used to open the NTD if the customer has locked it.
2. The slot for an additional security device (e.g. wire with a lead seal) is for possible future use for added security or tamper detection.

5.11 Customer notification

Where a Telstra NTD is installed, the customer shall be informed in writing of the existence of the NTD in the format shown in Figure 31 . A customer information sheet (reproduced in Figure 31) is normally supplied with each NTD for this purpose. You may use your own version of this information sheet to include your details and company logo if you wish, as long as the text of the sheet is not altered.

This information sheet may be handed to the customer at any time between the commencement and completion of the work. If the customer is not in attendance for any reason, the sheet may be left where the customer will find it (e.g. in the letterbox, under the front door, on the kitchen bench,), otherwise it may be mailed via post.

Figure 31 Customer notification of the installation of an NTD

Dear Customer

Your building has been cabled for connection of telecommunications services via a Telstra Network Termination Device (NTD). The NTD is a light brown plastic box that is embossed "Telstra" and "NETWORK TERMINATION DEVICE". The NTD is located:

.....

(Installer to complete)

Your NTD contains a test socket you can use to test your telephone or DSL service if it is not working properly. If you wish, you can secure the cover of your NTD with a small padlock.

Telstra's Network/Your Equipment

Telstra's network includes the cabling up to, and including, the NTD. Telstra has responsibility for maintaining this part of the network. Depending on the terms and conditions of your service agreement, either Telstra or your service provider will maintain your service on your side of the NTD (depending on your service agreement, charges may apply if the fault is in your cabling or equipment). You may also engage any registered telecommunications cabling provider to add, alter or repair cabling on your side of the NTD.

Fault Testing Self Help

If a fault develops in your telephone or DSL service, please carry out the steps listed below. Your service provider may ask you to carry out these steps if you contact them.

1. Unplug all telecommunications equipment and plug a standard telephone into each wall socket one by one. If you have a security alarm, plug the telephone into the wall socket used to connect the alarm panel first (the alarm panel is usually installed out of sight, e.g. in a robe or a cupboard).
2. If the telephone service doesn't work at any wall socket and you have another telephone you can use, repeat step 1 using that telephone.

If the telephone service works at any wall socket, it is likely that the service is working at the Telstra NTD but some of the cabling on your side of the NTD is faulty. In this instance please contact your service provider or any registered telecommunications provider to organise repair of your cabling (charges may apply).

3. If your telephone or DSL service doesn't work at any wall socket or you want to confirm that the service is working properly at the Telstra NTD, you can test the service at the NTD. You will need a standard (flat blade) screwdriver or a Phillips-head screwdriver to open the NTD cover, and a cord terminated with a 6-position modular ("RJ11") plug to connect your telephone or DSL modem to the test socket inside the NTD. Open the NTD and follow the instructions on the inside of the NTD cover. Please don't forget to close the NTD cover properly when you have finished testing.
4. If the service doesn't work at the NTD, or if you have carried out steps 1 and 2 and you can't test the service at the NTD, contact your service provider. If your service provider is Telstra, contact Telstra.

Digital Subscriber Line (DSL)

- ❑ Your NTD contains a DSL central filter. Your DSL modem must be connected to the wall socket marked "DSL", "DSL MODEM", "DATA" or similar. In-line DSL filters are not required to connect telephone equipment to the other wall sockets.
- ❑ Your NTD does not contain a DSL central filter. Unless a separate DSL central filter is installed elsewhere in your building, you may connect a DSL modem to any wall socket and telephone equipment may be connected to any other wall socket via an in-line filter.

(Installer to tick the box that applies)

Yours faithfully

..... (Installer)

..... (Company)

..... (Contact number)

5.12 Telstra notification

The NTD installer shall notify Telstra of the installation of each Telstra NTD by e-mail to the e-mail address F0100989@team.telstra.com for recording in Telstra's database. The details required are shown in Figure 32.

Figure 32 Telstra NTD installation advice to Telstra

To: F0100989@team.telstra.com

Subject: NTD Install

Date installed:	(DD/MM/YY)
Address:	(Unit no. if applicable/Street no. and street name) (Suburb or town, Postcode, State or Territory)
Customer name (if known):	(If unknown, simply omit this line)
Service no. (if known):	(If unknown, simply omit this line)
Exchange area (if known):	(If unknown, simply omit this line)
Cable details (if known):	(If unknown, simply omit this line)
Components installed:	(Example) 1 x Line module standard 1 x Line module DSL 1 x Bonding/Earthing conductor
Installer details:	
Name	(First name and last name)
Cabler registration no.	(Number on your registration card)
Company	(If applicable)
Contact no.	(Include area code if a fixed service no.)

5.13 Telstra NTD retrofit guidelines

5.13.1 Introduction

Telstra's standard cabling arrangement for homes built since November 1996 is shown in Figure 4. Alternative cabling methods where an NTD is installed are shown in Figure 2 and Figure 3.

Where a Telstra NTD is to be installed on an existing installation (i.e. an NTD retrofit), this should be a relatively easy task for those homes that have been cabled in accordance with Figure 4. In other cases (e.g. homes built before 1997), the task may be formidable. The following pages provide guidance to cabling providers for retrofitting a Telstra NTD including typical installation examples.

It is assumed that, in most cases, the NTD is being retrofitted to support the installation of a high-speed DSL service such as ADSL2+ or VDSL2 or that the installation may need to support such services in the future. Therefore, emphasis is placed on maintaining the integrity of the lead-in cabling to the NTD and any cable to be used — or that is likely is to be used — for the connection of a DSL service. The integrity of any cables to be used for a telephone service (including any telephone service derived from a VOIP modem) is less critical due to the low bandwidth used for voice communication.

5.13.2 NTD location

The NTD shall be located in accordance with 5.4 (page 20).

The cabling provider shall check for any existing Telstra wall boxes or other devices that may contain Customer Lightning Protection (CLP), including any "lead-in extension cabling" described in 5.2 (page 15). A cabling provider is **not** authorised to install a Telstra NTD where "lead-in extension cabling" has been installed or needs to be installed. This must be done by Telstra.

Where CLP has been provided, the NTD (which has inbuilt lightning protection) shall be used to replace the existing CLP. In such cases, the installer of the NTD shall ensure that an equipotential bonding (earthing) conductor is provided between the electrical earthing system and the NTD in accordance with AS/CA S009 and is connected to the NTD in accordance with 5.9.3.1 on page 34.

5.13.3 Intermediate cable joints

5.13.3.1 General requirements

Intermediate cable joints may be required to install the NTD at the required location and height. Such joints may already exist (e.g. fascia blocks/boxes) or new joints may need to be installed to extend the cables to the NTD.

There shall be no more than one cable joint, whether existing or new, between the point where the aerial/underground lead-in cabling meets the building and the NTD. Any new lead-in cable joint shall be made in accordance with 5.13.3.2.

No more than one joint should be installed in the cabling between the NTD and any TO. The joint should be made in accordance with Clause 5.13.3.2.

Note: Cabling between the NTD and any TO that is to be used for the connection of a DSL modem should not contain any joints and should be rated at Category 5 (or "5e") or Category 6.

5.13.3.2 Jointing method

Where it is proposed to join a new cable to the existing lead-in cable between the point where the underground or aerial lead-in cable meets the building and the NTD:

(a) The cable used shall have at least the same number of pairs as the existing cable and shall comply with Clause 5.13.4.2 on page 51.

(b) The new cable shall replace part or all of the existing cable on or in the building and shall **not** be teed (star wired) into the existing cable.

(c) All pairs of the existing cable shall be joined through to the NTD using the corresponding pairs of the new cable (see Table 2 on page 50 for cable colour codes).

(d) The joint shall be made using moisture resistant connectors (MRCs) housed in the box illustrated in Figure 33 and installed in an accessible location (e.g. on the external surface of the building or in accessible underfloor or roof space).

(e) The MRCs used shall be filled with grease or gel and designed to connect 0.40 mm to 0.90 mm diameter (26 AWG to 19 AWG) solid copper conductors.

(f) The MRCs shall be used in accordance with the manufacturer's instructions and shall be crimped using the tool recommended by the MRC manufacturer. Pair twist shall be maintained as close as possible to the MRCs.

(g) Screw terminals of any description shall **not** be used for connection or jointing of Telstra lead-in conductors unless they form part of an existing Telstra connection device that is serviceable and is to be re-used.

Figure 33 Telstra jointing box Material No. 7700118 (Madison MT1005B)

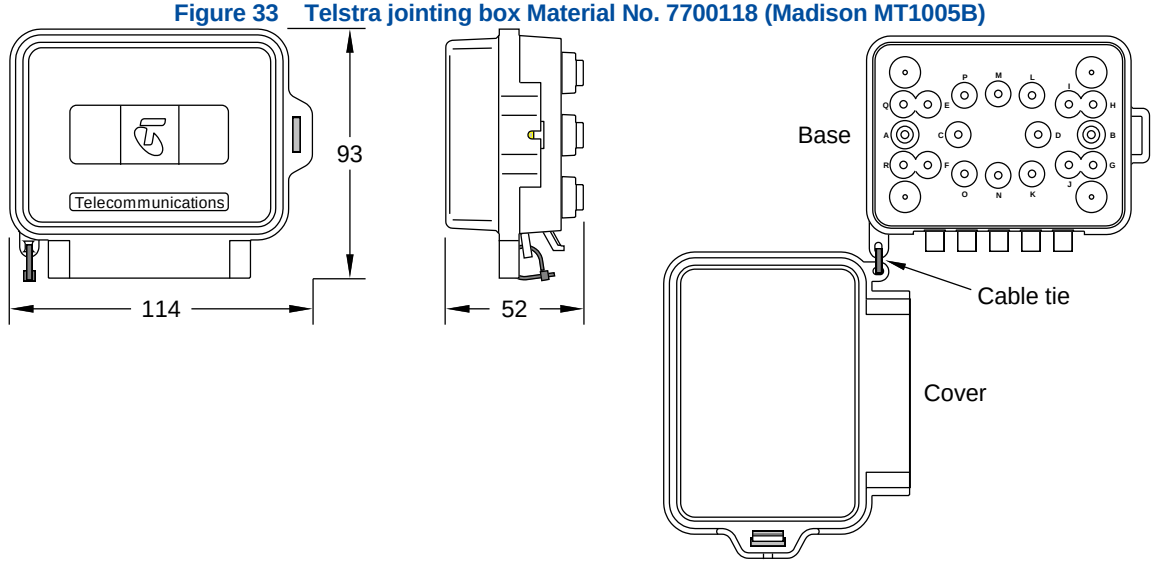
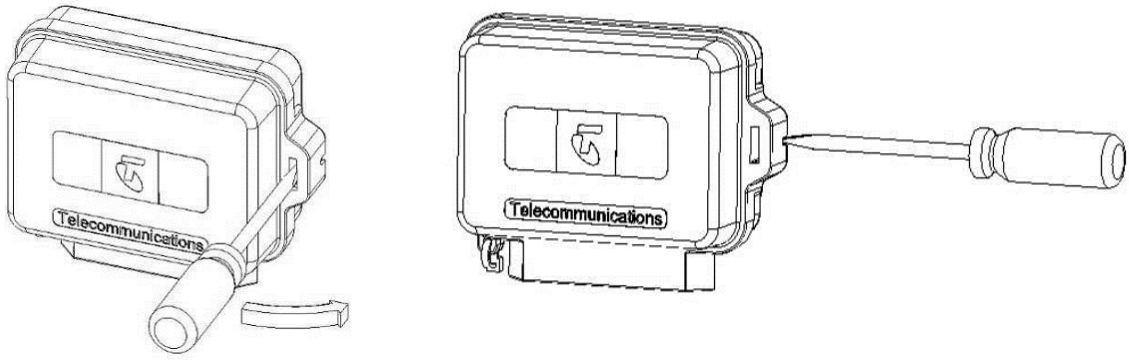
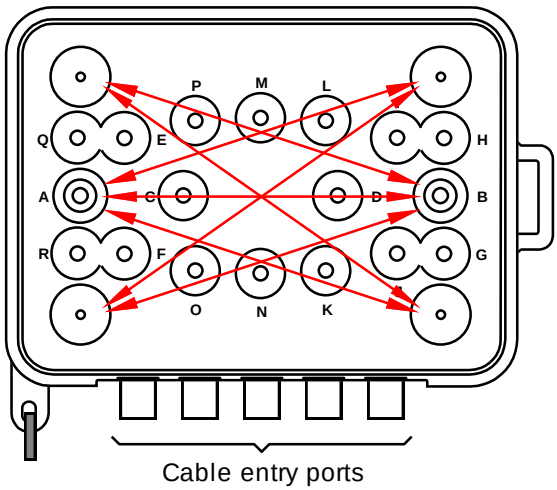


Figure 34 Opening the cover of the jointing box MT1005B



Note: Remove the cover of the jointing box using a flat-blade screwdriver to disengage the retaining clip, either from the front or the side of the box, as shown above. The cover is tethered to the base by a cable tie.

Figure 35 Fastening the jointing box



Notes:

1. Where the box is located on an external surface of the building, it shall be mounted on a vertical surface with the cable entry ports at the bottom.
2. Select the best position for the box and the most appropriate pair of mounting holes, indicated by the arrows, for minimal buckling of the base and maximum purchase of the mounting screws. Additional screws may be used if necessary, but ensure that these do not buckle the base if mounted on an uneven surface (use packing material behind the box if necessary).
3. Where the middle mounting holes (A and B) are used, it should be possible to push the screws through the thin plastic membrane without drilling them. For the other mounting holes, drill holes no larger than 4 mm (5/32") diameter through the mounting depressions in the base of the box. Use at least 25 mm long, no. 6 to no. 8, countersunk-head screws to secure the box to the mounting surface (use expanding plugs in masonry walls). Do **not** use impact fasteners.

Figure 36 Typical moisture resistant connectors and associated connector crimping tool

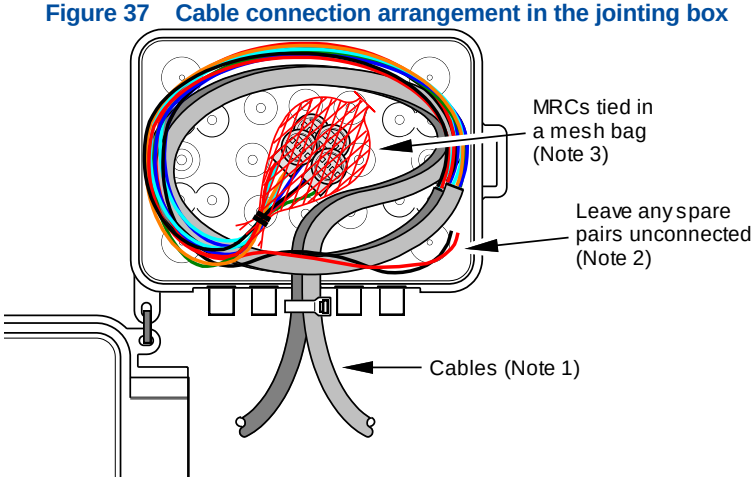
2-wire moisture resistant connectors (Telstra material no. 51300182)

Hand tool for moisture resistant connectors (3M Scotchlok™ Crimping Tool Model E-9J Telstra material no. 11400207)

Notes:

1. Moisture resistant connectors used for joining Telstra lead-in cable shall be filled with grease or gel and designed to connect 0.40 mm to 0.90 mm diameter (26 AWG to 19 AWG) solid copper conductors.
2. The connectors shall be used in accordance with the manufacturer's instructions and shall be crimped using the tool recommended by the manufacturer of the connectors.
3. Maintain pair twist as close as possible to the moisture resistant connectors. Push the two conductors to be joined in their respective holes in the connector. Ensure that both conductors are pushed in fully, and crimp the connector using the crimping tool specified by the connector manufacturer.
3. Screw terminals of any description shall **not** be used for connection or joining of Telstra lead-in conductors unless they form part of an existing Telstra connection device that is serviceable and is to be re-used.

Figure 37 Cable connection arrangement in the jointing box



Notes:

1. Cable entry is via the bottom entry ports only. Holes shall **not** be drilled in the rear, top or side of the box. The cable ports may be drilled, cut or torn out for cable entry. Drilling of close-fitting holes for each cable is recommended in Northern Australia where the ingress of ants to the box is a serious problem. Tie the cables lightly to the external cable tie supports using UV-resistant cable ties.
2. All pairs of the existing cable shall be joined through to the NTD using the corresponding pairs of the new cable (see Table 2 on page 50 for cable colour codes). Leave any spare pairs of the new cable coiled up in the box.
3. The conductors shall be tied lightly together with two or three turns of an insulated conductor off-cut about 25 mm away from the connectors, preferably in a mesh bag (Telstra material no. 43800053). Tying the conductors keeps the MRCs in a bundle to reduce the risk of damage, and minimises “socketing” of the grease/gel due to conductor movement in the connector.

Table 2 Cable colour code for small cables

Pair no.	2-pair cable	3-pair cable	4-pair cable colour code variations		
1	White Blue	White Blue	White Blue	White-blue Blue	White-blue* Blue-white*
2	Red Black	Red Black	White Orange	White-orange Orange	White-orange* Orange-white*
3		Orange Green	White Green	White-green Green	White-green* Green-white*
4			White Brown	White-brown Brown	White-brown* Brown-white*

* The first-named colour is the predominant colour.

5.13.4 Cabling installation

5.13.4.1 Monitored security alarm and personal response systems

Before cutting any cables to retrofit a Telstra NTD, try to ascertain whether the customer has a continuously monitored security alarm service (e.g. an internet-based monitored security system). If the customer does have a continuously monitored security alarm, it will be necessary to contact the monitoring security company beforehand. Note that it will also be necessary to contact the company to notify restoration of the service and perform a functional test on the security service once the work is completed.

If the customer has a normal dial-up security alarm, it should not be necessary to contact the security company unless you encounter an unusual wiring arrangement at the lead-in connection block/box and you are not confident that you have maintained the same wiring arrangement on the customer side of the NTD. For examples, see 5.13.4.7 on page 55.

Also check if a personal response (emergency call/medical alert) system is connected within the premises. If so, ensure that the system remains connected, using temporary wiring if necessary, while the NTD is being installed. Check correct operation of the system before leaving.

5.13.4.2 Cable type

Lead-in cable

Where the lead-in cabling to the NTD needs to be redirected, the existing cable may be re-used in whole or in part for connection to the NTD.

Any cable used to extend the lead-in cabling to the Telstra side of the NTD (i.e. via a joint made in accordance with 5.13.3) shall:

- be ACMA-compliant, outdoor type (e.g. black polyethylene-sheathed) cable;
- have at least the same number of pairs as the existing cable; and
- have solid (not stranded) copper conductors with a minimum diameter of 0.4 mm and a maximum diameter of 0.64 mm.

Customer cable

Category 5 (or “5e”) or Category 6 cable is recommended for all new customer cabling (i.e. between the NTD and any TO) due to its superior noise and crosstalk immunity for high-speed DSL services.

5.13.4.3 Outdoor cabling

Lead-in cabling

Where the lead-in cabling to the Telstra side of the NTD needs to be redirected or extended, it shall be installed in a manner consistent with the wiring rules (Australian Standard AS/CA S009) and 5.13.4.4 to 5.13.4.6 below. The cable shall comply with 5.13.4.2 whether or not it is enclosed in conduit.

Lead-in cabling that is run horizontally along an external wall shall be installed at least 100 mm above finished ground level. Lead-in cable on external walls shall be enclosed in conduit unless the cable is installed higher than 2.4 m or is protected from impact or abrasion by an overhang or similar building feature. Cable may be run as surface cabling without enclosure in conduit along a beam, fascia, soffit moulding, etc. Corrosion-resistant and UV-resistant cable fastenings shall be used on external surfaces.

Lead-in cable or conduit shall be run either vertically or horizontally and not diagonally unless it is to be run in parallel with a sloping feature such as a bargeboard on a gable wall.

The lead-in conduit shall be fastened at the maximum intervals described in 5.13.4.4 and within 150 mm of the NTD.

Galvanised saddles or half-saddles shall be used for fastening lead-in conduits to external surfaces.

Note: Plated (e.g. zinc passivated) saddles or half-saddles are not suitable for external use.

Customer cabling

Customer cabling must be installed in accordance with the wiring rules (Australian Standard AS/CA S009). This is the minimum, legal requirement. In addition, customer cabling should be installed in accordance with 5.13.4.4 to 5.13.4.6.

5.13.4.4 Use of conduit

Customer cable on external walls should be enclosed in conduit unless the cable is installed more than 2.4 m from finished ground level or otherwise protected from impact or abrasion by an overhang or similar building feature. Cable may generally be run as surface cabling without enclosure in conduit along a beam, soffit moulding, fascia, etc. Any cable exposed to sunlight (e.g. not protected by enclosure in conduit) must be an outdoor type cable (e.g. black polyethylene-sheathed cable).

Lead-in cables and customer cables should be run in separate conduits. However, where this is not practical, up to two customer cables may be run in the lead-in conduit as long as all of the following requirements are met:

- The part of the conduit used does not run underground.
- The inside diameter of the conduit is at least 23 mm.
- The part of the conduit used does not contain more than 2 large-radius (at least 100 mm) bends.
- Each customer cable does not exceed 6 mm in diameter.

Rigid conduit should be used for straight or long cabling runs but corrugated (flexible) conduit may be used for short cable runs or difficult bends on the surface of the wall.

Conduit couplings and fittings should be glued or arranged to prevent the entry of water and so as to allow any water that may get in to drain out. An example of a suitable arrangement that does not require the conduit couplings to be glued is if the socket is above the spigot for vertical or diagonal conduit runs.

Note: Any indoor type cable that is continually immersed in water within the conduit will be prone to failure.

Conduit should be fastened at distances no greater than:

- 900 mm for vertical rigid conduit
- 450 mm for vertical corrugated (flexible) conduit
- 600 mm for horizontal or diagonal rigid conduit
- 300 mm for horizontal corrugated (flexible) conduit.

5.13.4.5 Surface cabling without conduit

Cable installed on any surface without enclosure in conduit should be fastened at distances no greater than:

- 500 mm for vertical cable runs
- 300 mm for horizontal or diagonal runs.

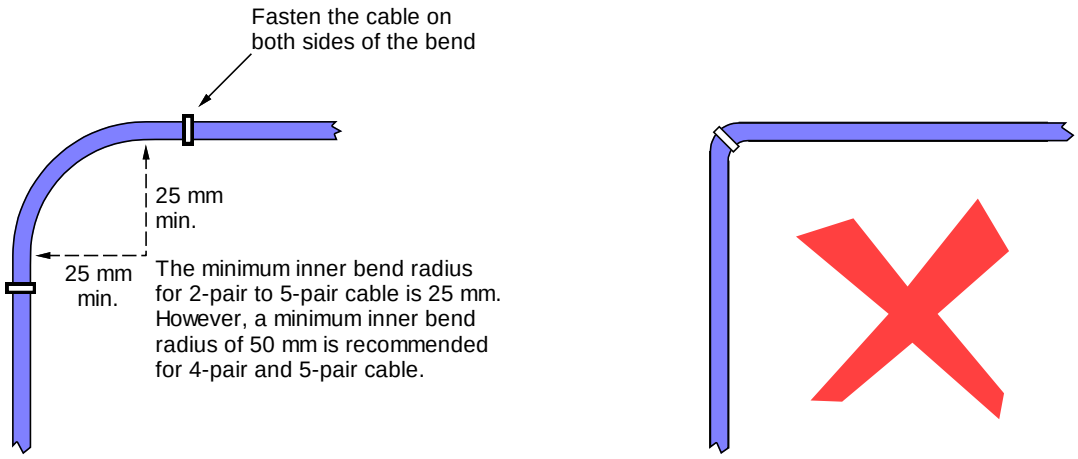
The cable bend radius should not be less than 4 times the cable diameter and, in any case, should not be less than 25 mm for cable sizes between 2 and 4 pairs. The cable should be fastened on each side of the bend. Corrosion-resistant fastenings should be used on external walls. Refer to Figure 38.

Category 5/5e or Category 6 cable should not be stapled using a machine stapler unless the stapler is specifically designed for use on such cables. Category 5/5e or Category 6 cable installed as surface cabling should be supported by suitably sized plastic cable clips (e.g. 6 mm round), or by enclosure in conduit or trunking.

Note: Any pressure exerted on the cable by a staple may degrade the performance of the cable.

Figure 38 Fastening cable at bends

Correct method **Incorrect method**



Note: Fasten the cable immediately before and after the bend, not in the middle of the bend.

5.13.4.6 Separation from other services

Separation from low voltage (LV) power cables

Any cable installed on or in the building must be separated from LV power cables by:

- a minimum distance of 50 mm; or
- a barrier of durable insulating material or metal (e.g. cable housed in conduit); or
- a timber or metal stud, nogging, joist, beam, rafter or roof truss of any thickness.

These separation requirements are summarised in Figure 39.

A telecommunications cable and an LV power cable must not pass through the same bore hole within 50 mm of any securing face of building framework whether or not there is a barrier between the cables. In other cases, telecommunications cable may pass through the same hole (e.g. through the fabric of a floor or wall) as LV power cable if either the telecommunications cable or the LV cable is installed in insulating or metal conduit or suitably designed trunking or ducting that provides a durable barrier between the telecommunications cable and the power cable.

Note: Drills, nails or screws driven into the building framework could penetrate cables passing through bore holes even if the cables are installed in conduit. Simultaneous damage to the cable insulation of both wiring systems may result in the transfer of a hazardous voltage to the telecommunications wiring system.

Any telecommunications connection/jointing device installed on or in the building should be separated from LV power cables and LV power switching or connection/jointing devices by a minimum distance of 150 mm.

Note: This is an operational/access clearance, not a safety requirement. This distance may be reduced in some circumstances, as long as the cable connections/joints of both the LV power cables and the telecommunications cables are separately enclosed in either an insulating (e.g. plastic) enclosure or an earthed metallic enclosure.

Separation from high voltage (HV) power cables

Telecommunications cabling installed on or in the building shall be separated from HV power cables by:

- a minimum distance of 450 mm for single-core HV cables; or
- a minimum distance of 300 mm for multi-core HV cables (e.g. aerial bundled cable) unless either the telecommunications cable or multi-core HV cable is installed in insulating conduit, in which case the distance may be reduced to 150 mm (refer to Figure 40).

Any telecommunications connection/jointing device installed on or in the building shall be separated from any HV power cables, switching equipment or connection/jointing devices by a minimum distance of 450 mm in all circumstances.

Separation from services other than power cables

Telecommunications cables on or in the building must be separated from other **non-hazardous**, **non-telecommunications** services (such as plumbing) so as **not to impede access to, or repair of, the other service**. Telecommunications cables must **not be fastened to** plumbing pipes or the conduits of other services.

Note: A minimum clearance of 50 mm is recommended by Australian Standard AS/CA S009 where the telecommunications cabling runs alongside the other service cables, conduits or pipes.

Where the other service is deemed to be **hazardous** (e.g. gas pipes, oil pipes, steam pipes, hot water pipes exceeding 60°C and compressed air pipes), the telecommunications cable must be separated from the other service by a minimum distance of **150 mm** whether or not the cable is installed in conduit.

Note: This separation requirement reduces the risk of damage to the telecommunications cabling or the other service during installation or repair activities, which may cause personal injury or damage to property.

No separation is required between cables of **different communications cabling systems**, such as telephone, data, TV (coaxial), audio (speaker wires), etc.

No separation is required between telecommunications cables and **earthing conductors** (whether these are associated with telecommunications or power) **except for lightning down-conductors**.

Lightning down-conductors

Lightning down-conductors are earthing conductors installed between a lightning rod or strip located on the roof of the building to an earthing electrode or earthing mat at the base of the building. These are rarely installed on single dwellings but may be installed on multi-storey apartment buildings. Lightning down-conductors are designed to carry thousands of volts and amperes in the event of a lightning strike. It is important to keep metallic cables well away from such conductors to avoid “side-flashing” which may cause fire or injury.

Telecommunications cabling and connection devices must be separated from lightning down-conductors by a minimum distance of **9 metres** unless this is impractical, in which case the cabling must be separated from any lightning down-conductor in accordance with the requirements of Australian Standard AS/NZS 1768, *Lightning protection*.

Notes:

1. A separation distance less than 9 m will usually require assessment by a suitably qualified electrical engineer.
2. An earthing conductor for a **domestic** TV antenna or satellite dish is not classed as a lightning down-conductor.

Broadband isolation boxes and other carriers’ equipment

Telecommunications connection/jointing devices should be separated from Telstra/FOXTEL broadband (coaxial) isolation/security boxes or other carriers’ equipment by a minimum distance of **100 mm**.

Figure 39 Summary of separation requirements from LV power cables and non-electrical hazardous services for indoor cabling and outdoor surface cabling

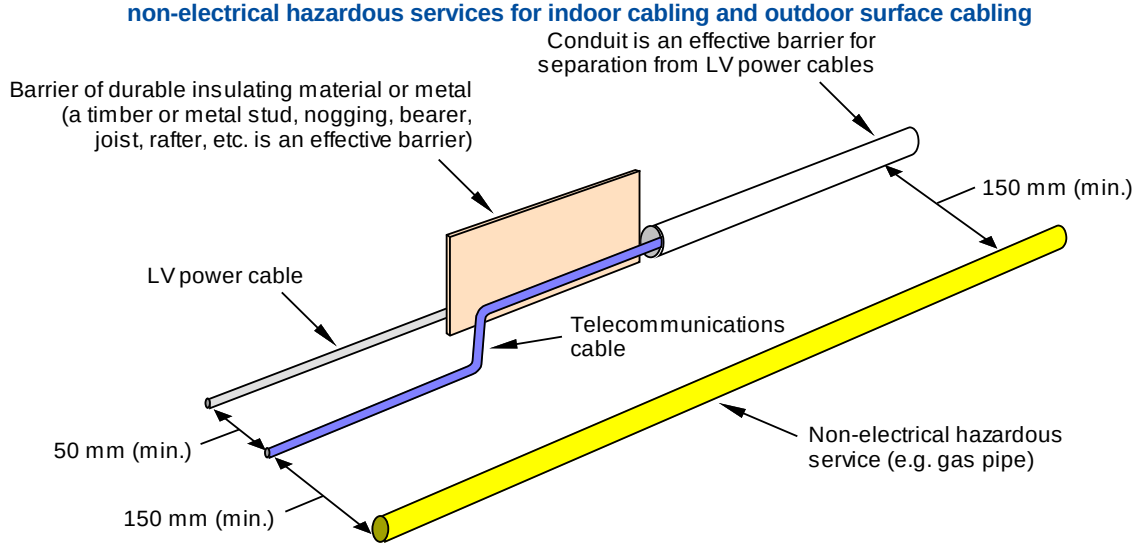
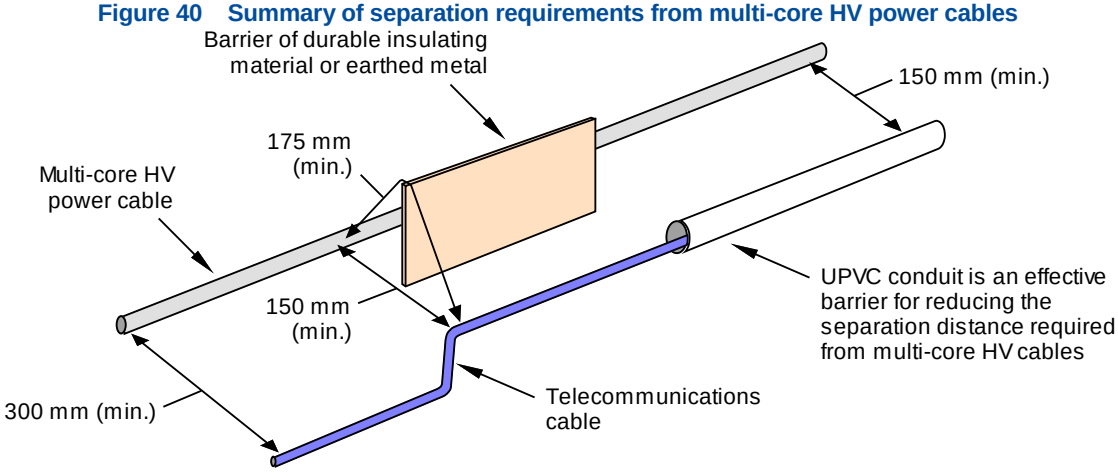


Figure 40 Summary of separation requirements from multi-core HV power cables



Note: If the power cable is a single-core HV cable, the minimum separation required is 450 mm whether or not there is any form of barrier between the HV cable and the telecommunications cable.

5.13.4.7 Unusual or difficult wiring arrangements

Many buildings will be star-wired from a connection block/box near the building entry point. Star wiring of telecommunications outlets (sockets) was common practice in some areas prior to 1989 and has continued since then in some cases notwithstanding that the practice is no longer supported by Telstra (except from an MDF or NTD).

Where star-wiring practices have been employed, the wiring arrangement may be straightforward, as indicated in Figure 41. However, there will be cases where one or more pairs have been back-fed and through-connected via the star-wiring block/box. A simple example is shown in Figure 42 — in this case a "Mode 3" wiring arrangement for an automatic dialling alarm.

Relatively straightforward wiring arrangements like those shown in Figure 41 and Figure 42 may be made on the customer side of the NTD, e.g. using 2-wire or 3-wire moisture resistant connectors or other jointing techniques compliant with the wiring rules. However, in some cases it will be difficult to work out how certain TOs have been wired and why they have been wired this way. For example, the building may have been wired for old 3-wire or 4-wire "parallel telephone" connections, 4-wire or 6-wire Commander stations, earth recall or Telemeter earthing/control, etc. Such wiring may no longer be in use, but it is always safer to assume that it is.

No matter how TOs have been wired, it is important that they continue to function as they did before retrofitting an NTD — particularly if they are used to connect security alarm systems, personal response (emergency call/medical alert) systems, fax machines, and the like.

To minimise the risk of inadvertently disconnecting or disabling existing equipment, apply the following procedures when retrofitting an NTD:

(a) If practicable, leave any star-wired connections and joints intact and simply connect them to the customer side of the NTD as shown in Figure 43.

(b) When joining any cables, always join all pairs whether or not you think they're being used for anything.

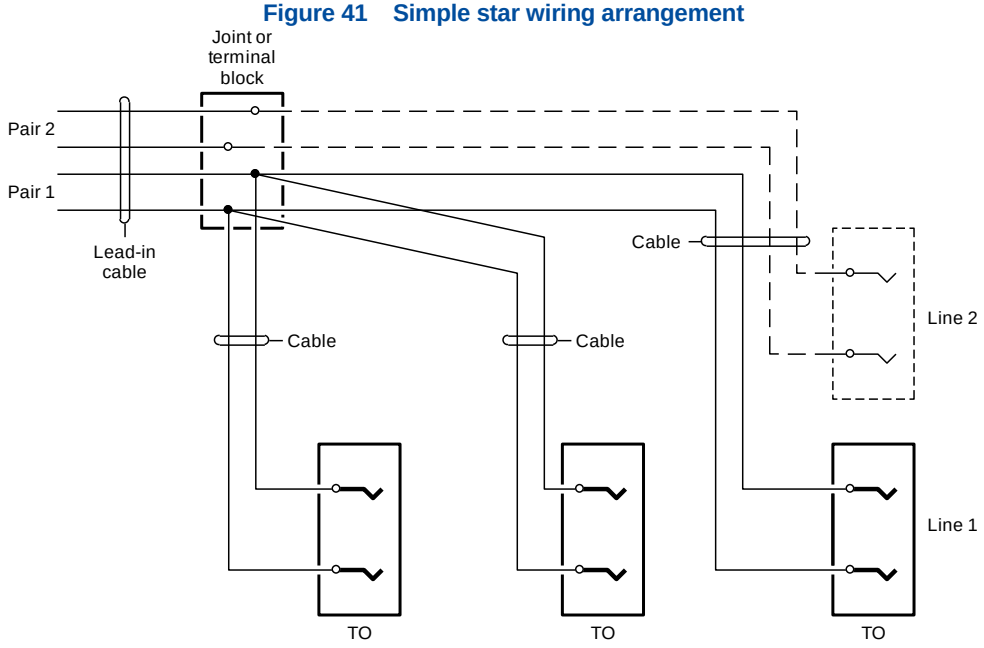
(c) When connecting or joining cables, always maintain the proper cable pair relationship, i.e. pair 1 to pair 1, pair 2 to pair 2, etc.

(d) Always maintain pair leg relationship (polarity), i.e. "A" leg to "A" leg and "B" leg to "B" leg.

(e) Be alert to the possibility of back-fed pairs interconnecting sockets, as shown in Figure 42.

(f) If a high-speed DSL service (e.g. ADSL2+, VDSL2) is required, run a new, separate Category 5 (or “5e”) or Category 6 cable from a central filter in the NTD to the DSL modem TO in accordance with Figure 8 on page 19.

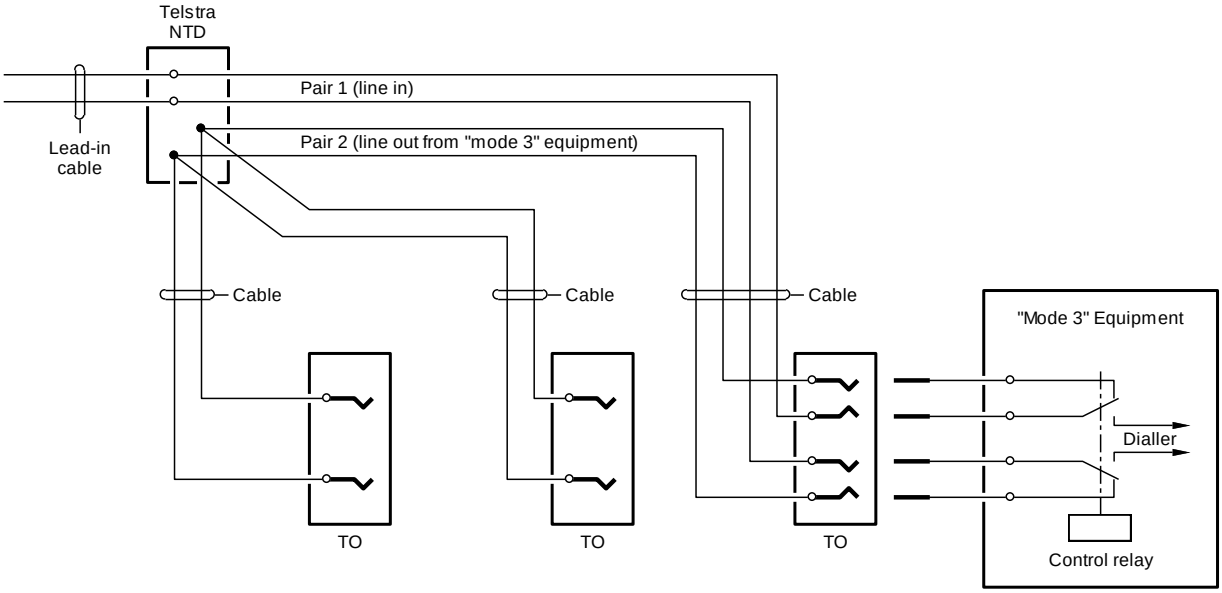
Figure 41 Simple star wiring arrangement



Notes:

1. The above diagram shows a simple star-wiring arrangement frequently encountered.
2. The second pair of the lead-in cable may also have been joined to the second pair of one of the cables to the TOs, or to a separate cable, for connection of a second line as indicated by the dotted lines.

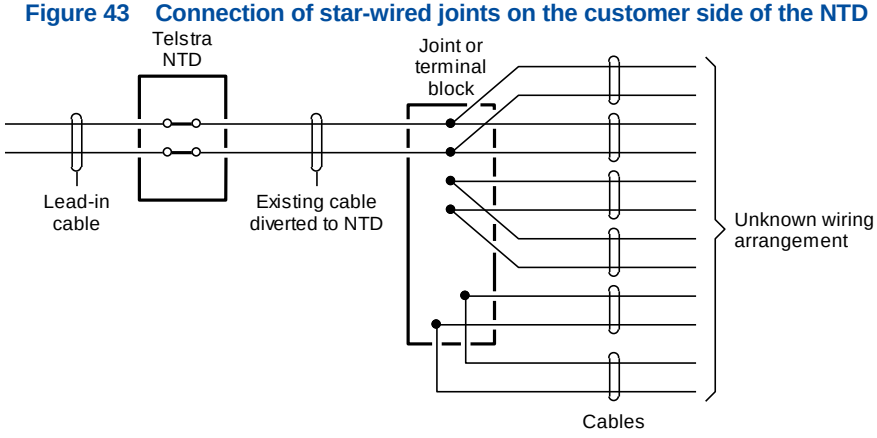
Figure 42 Star wiring arrangement with back-feed of the “line out” from “Mode 3” equipment



Notes:

1. The "Mode 3" equipment disconnects the line from the other TOs when activated.
2. The back-fed pair (“line out”) from the "Mode 3" equipment may be separately joined to the other customer cable pairs within the space on the customer side of the NTD, e.g. using 2-wire or 3-wire connectors. More complex wiring arrangements/joints may be simply left intact and connected on the customer side of the NTD as shown in Figure 43.

Figure 43 Connection of star-wired joints on the customer side of the NTD



Notes:

1. In some cases, it may be prudent to leave the existing wiring and connections intact, including the original lead-in cabling to the connection block/box, and simply divert the existing lead-in cabling from the connection block/box to the customer side of the NTD.
2. Examples of more complex wiring arrangements that may be encountered in residences and small businesses are:
   - 3-wire or 4-wire "parallel telephone" connections
   - 4-wire or 6-wire Commander station wiring or other small business system wiring
   - earth recall or Telemeter earth/control leads.
3. If a high-speed DSL service (e.g. ADSL2+, VDSL2) is required, run a new, separate Category 5 (or “5e”) or Category 6 cable from a central filter in the NTD to the DSL modem TO in accordance with Figure 8 on page 19.

5.13.5 NTD retrofit examples

5.13.5.1 General

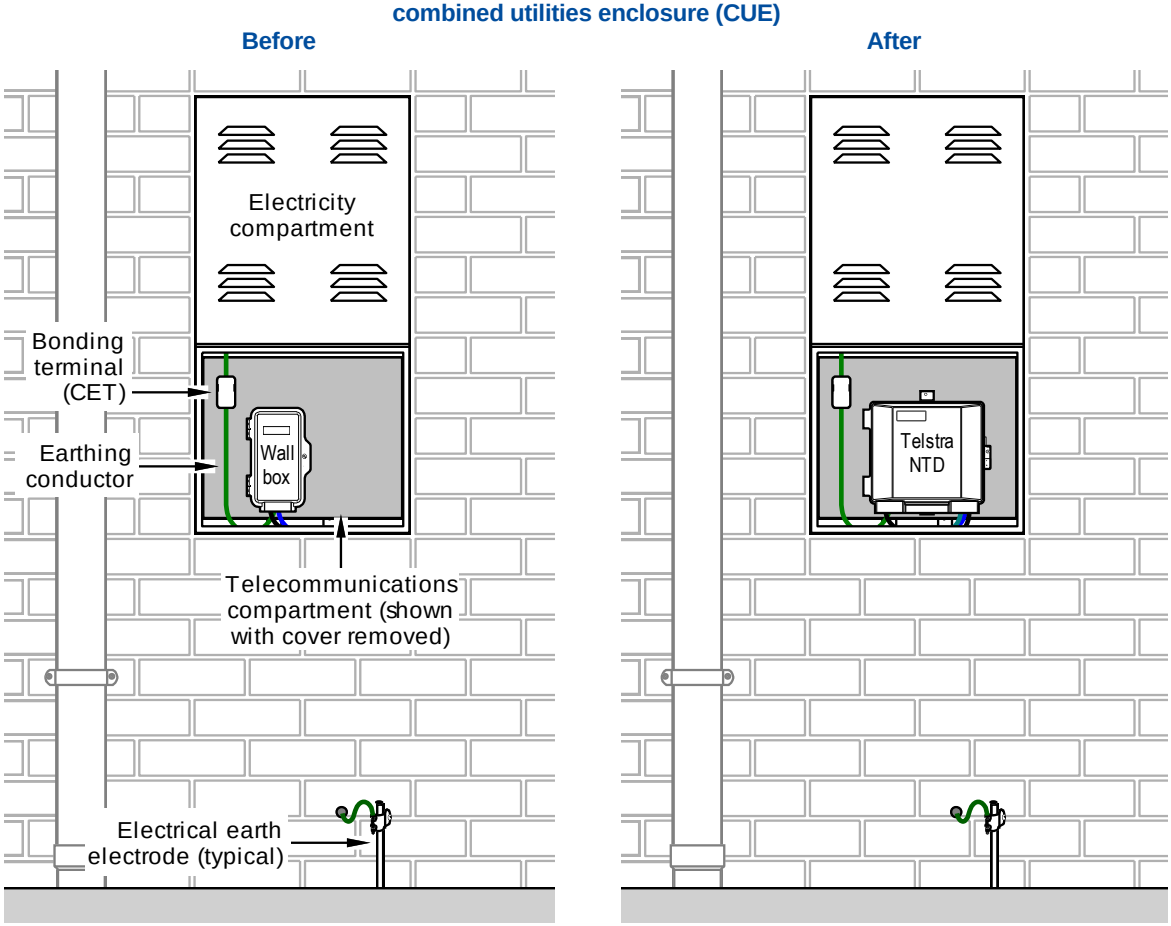
Cabling practices for residential premises have varied over the years, and the cabling provider will encounter a wide variety of cabling arrangements. Since November 1996, it has been standard Telstra practice to install an external lead-in connection box at or near the building entry point. However, prior to then it was common practice in some areas to run the underground lead-in conduit directly into the building such that the lead-in cabling to the first telecommunications outlet is totally concealed. With some of these installations, it will be virtually impossible to retrofit an external NTD unless the existing lead-in cabling is intercepted underground and/or re-installed (cabling providers are **not** authorised to do this).

Typical cabling arrangements and methods of retrofitting NTDs are described hereunder. These are not intended to be exhaustive, but to provide the cabling provider with guidelines on how to approach common retrofit situations.

5.13.5.2 Replacing an existing wall box in a combined utilities enclosure (CUE)

If the Telstra wall box is installed within a combined utilities enclosure, simply replace the wall box with the Telstra NTD as shown in Figure 44. If the NTD won't fit in the enclosure, it must be installed on the external wall beside the enclosure, in which case the existing wall box may need to be left in place as a jointing box for the existing lead-in cable.

Figure 44 Replacing a Telstra wall box with a Telstra NTD in a combined utilities enclosure (CUE)



5.13.5.3 Replacing an existing external wall box or wall-mounted protector block

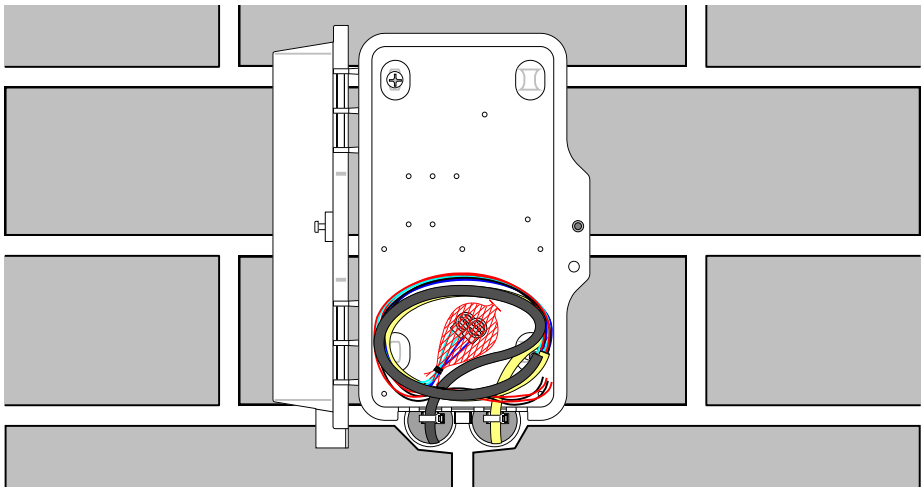
Several styles of external connection devices have been used by Telstra over the years to connect the outdoor part of the lead-in cable to the indoor cable (refer to Telstra Document No. 012882, otherwise

known as “A2A”). The current standard Telstra connection device is the wall box shown in Figure 45. In some areas, an integrated coaxial/telephony box may have been used (see 5.13.5.4).

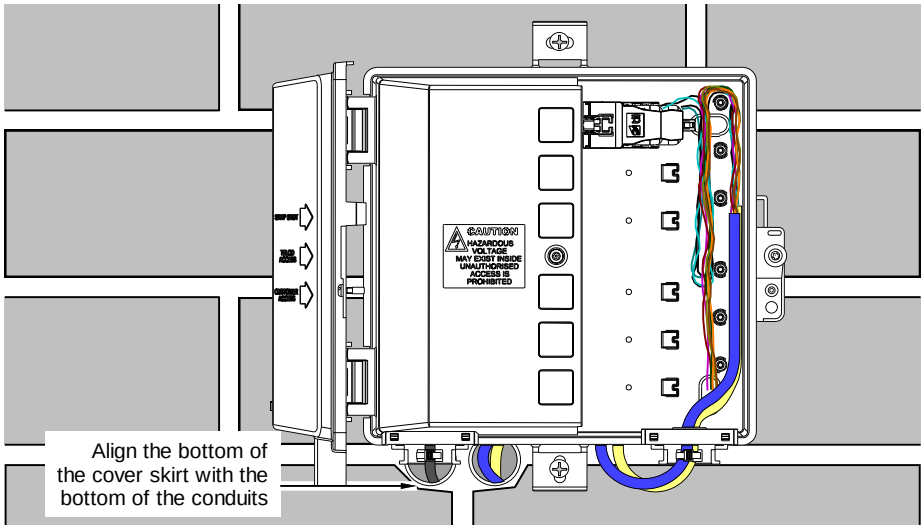
Figure 45 to Figure 49 provide guidelines for replacement of existing connection devices that are located at or near the required height for the NTD. Where the existing connection box is too low or too high, refer to 5.13.5.5.

Figure 45 Replacement of an existing hinged-lid wall box with a Telstra NTD

Before



After

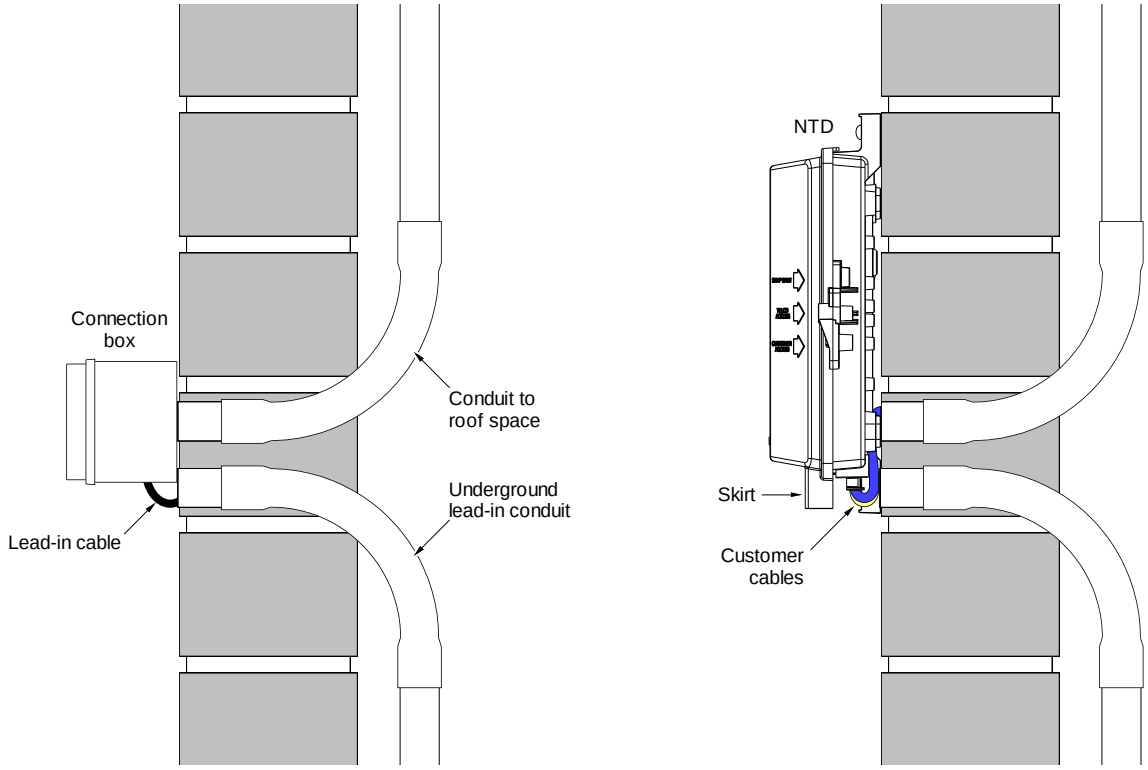


Notes:

1. The grey, hinged-lid Telstra wall box shown in the top drawing has been used as a lead-in connection box since 1999. The cable entries and the mounting holes for the NTD are very different to the wall box.
2. If the conduits are concealed in the wall and are side by side as shown above, position the NTD such that the bottom of the conduits are level with the bottom of the NTD cover and so that the conduits are either to the right or the left of the bottom NTD mounting tab, depending on which cable has enough slack available.
3. Run the cable to the far cable entry hole behind the NTD (see Figure 19 on page 32). For an NTD retrofit, it is allowable to fit the line module in one of the lower module positions if the existing cable won’t reach the top module position without making a joint in the cable.

Figure 46 Replacement of an old lead-in connection box with an NTD, concealed conduit
Option 1 — All cables concealed

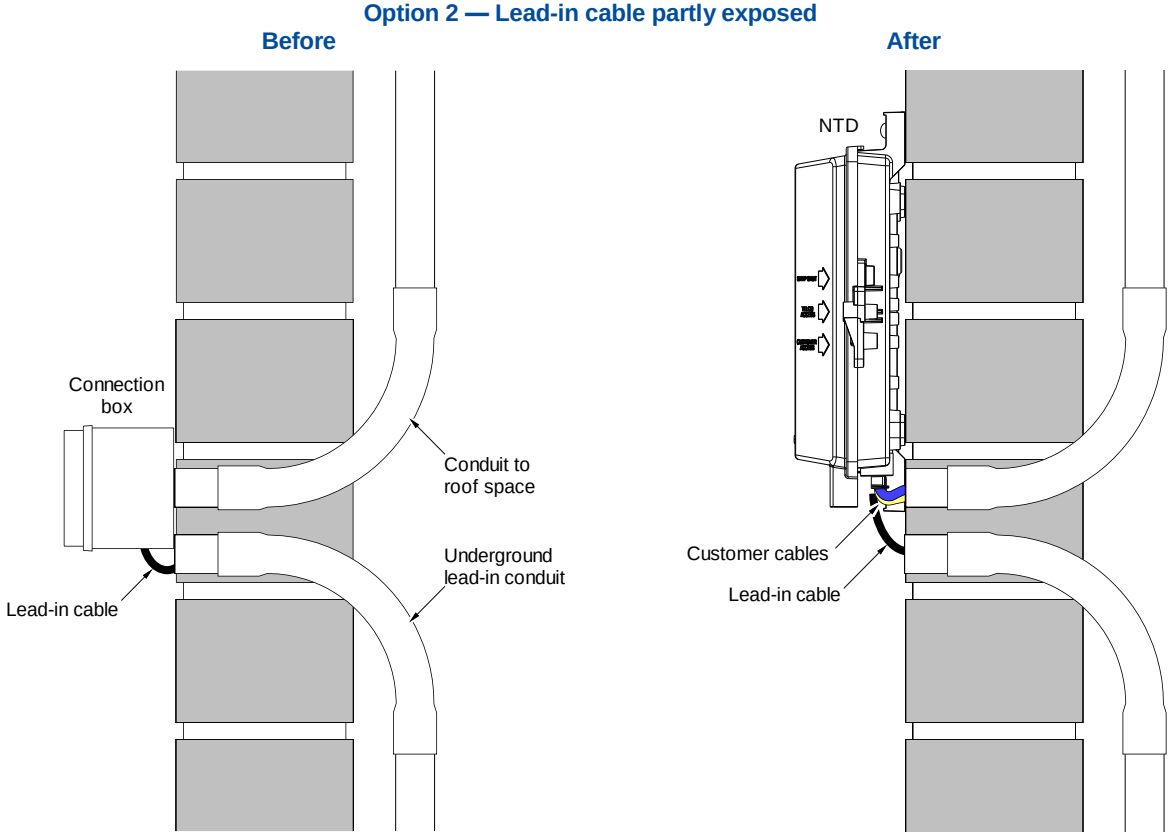
Before **After**



Notes:

1. With the old, oblong, screwed-lid box (commonly known as a "Luca" box), early practice was to position one conduit above the other as shown. In such cases, position the NTD in accordance with this diagram or Figure 47, as appropriate to the circumstances.
2. The cables must enter the NTD via the bottom cable entry holes. Under no circumstances are cables to enter the rear, top or side of the NTD.
3. Covering of the end of the underground lead-in conduit by the NTD base is prohibited. At least half of the conduit opening shall be uncovered to allow inspection for termite activity. The skirt on the NTD cover will conceal the conduit opening from general view.
4. Where the NTD needs to be raised higher to attain the minimum 500 mm distance from finished ground level, use techniques shown in Figure 52 and Figure 53 (pages 67 and 68) to extend the cabling to the NTD.

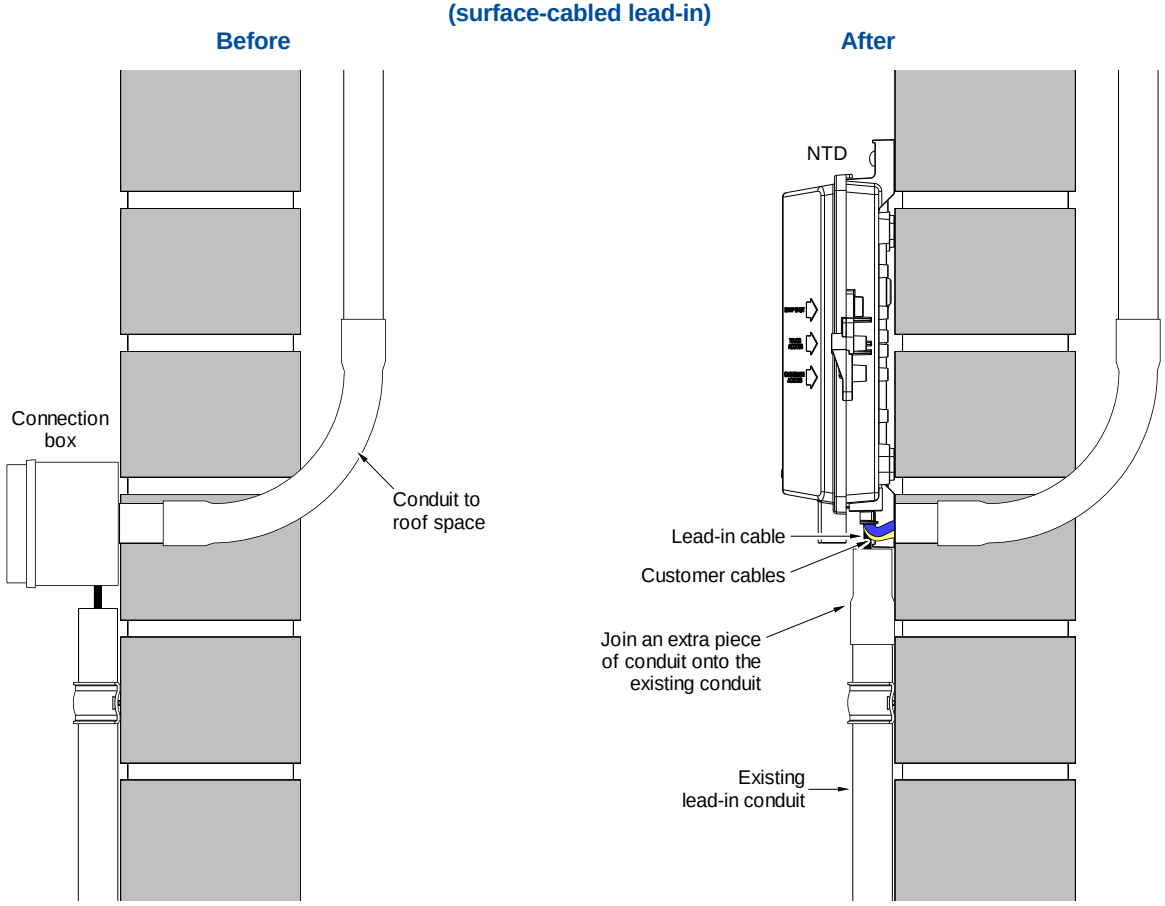
Figure 47 Replacement of an old lead-in connection box with an NTD, concealed conduit
Option 2 — Lead-in cable partly exposed



Notes:

1. With the old, oblong, screwed-lid box (commonly known as a "Luca" box), early practice was to position one conduit above the other as shown. In such cases, position the Telstra NTD in accordance with this diagram or Figure 46, as appropriate to the circumstances.
2. This arrangement leaves the customer cable conduit accessible without the need to remove the NTD from the wall, e.g. to add customer cables, while still protecting the customer cables from exposure to sunlight.
3. Where the NTD needs to be raised higher to attain the minimum 500 mm distance from finished ground level, use techniques shown in Figure 52 and Figure 53 (pages 67 and 68) to extend the cabling to the NTD.

Figure 48 Replacement of an existing lead-in connection box/block with an NTD (surface-cabled lead-in)

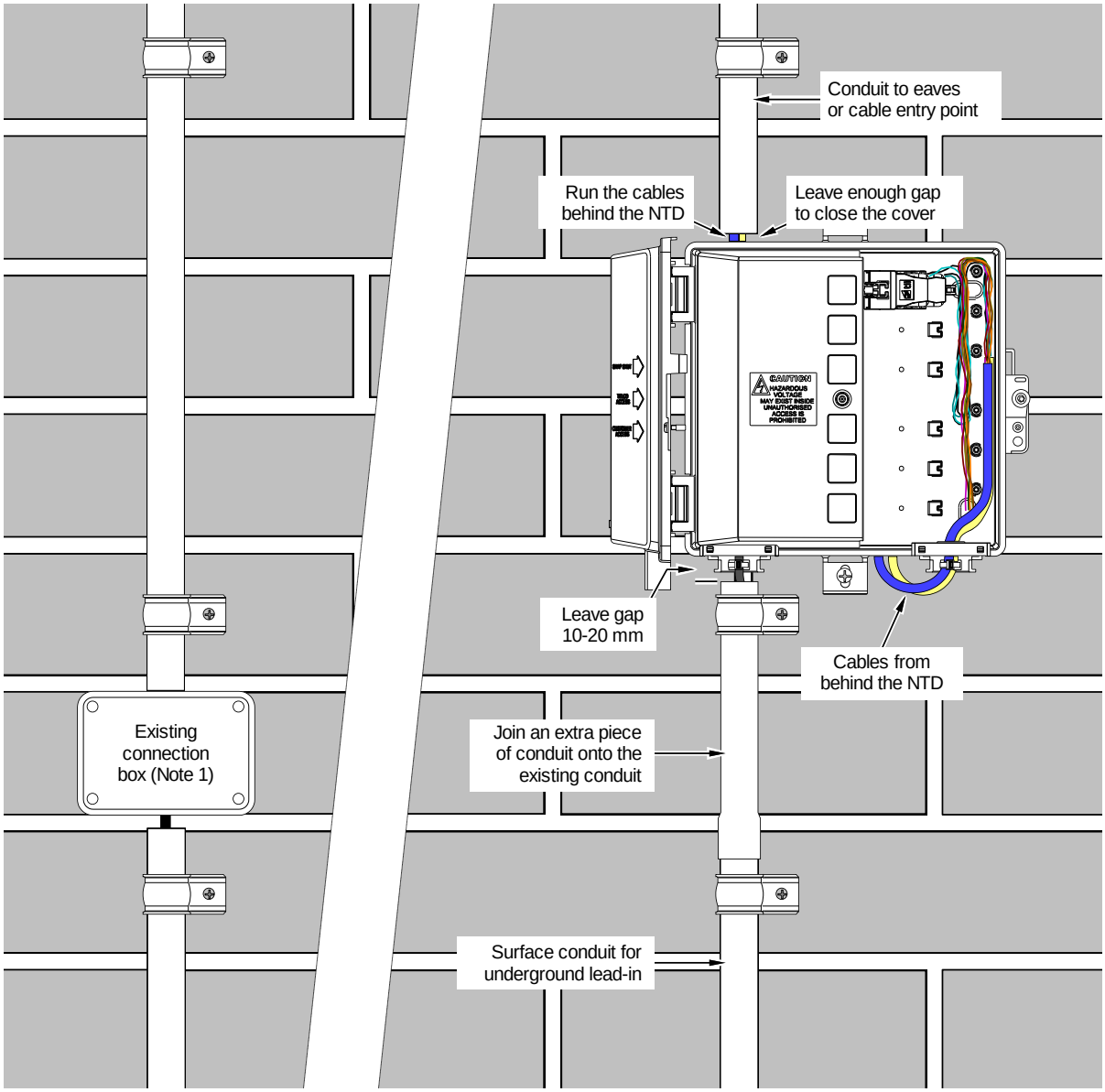


Notes:

1. It will usually be necessary to join a short length of conduit onto the existing lead-in conduit, as the bottom of the NTD will need to be higher than the bottom of the old connection box so that the opening of the conduit for the customer cable will be accessible.
2. Where the NTD needs to be raised further to attain the minimum 500 mm distance from finished ground level, use techniques shown in Figure 52 and Figure 53 (pages 67 and 68) to extend the customer cabling to the NTD.

Figure 49 Replacement of an old connection box with an NTD, surface conduits

Before **After**



Notes:

1. If the NTD needs to be installed higher than the existing connection box so as to be at the minimum height from the ground (500 mm), pull sufficient lead-in cable through the lead-in conduit to reach the NTD **as long as the cable comes freely**. Do **not** pull the lead-in cable too hard and do **not** pull any more cable than is required. If the lead-in cable won't reach the NTD, it will be necessary to leave the existing connection box in place and join an extra length of lead-in cable between the connection box and the NTD. In the above case, there should be sufficient length in the indoor cable to loop it behind the NTD and terminate it on the customer side of the NTD. Fit the line module in a lower position if the cables won't reach the module fitted in the top module position.
2. Trim one or both conduits to fit the NTD as shown. If necessary, join extra conduit as required to raise/lower the NTD to the minimum/maximum allowable height. Leave a 10-20 mm gap between the end of the lead-in conduit and the underside of the NTD (the lead-in conduit may butt up to the external cable tie support). Also leave sufficient gap between the end of the conduit and the top of the NTD for the cover to close.
3. If the existing connection box contains CLP, this must be removed and the equipotential bonding (earthing) conductor extended to the NTD using earthing conductor jointing techniques, if necessary, described in Australian Standard AS/CA S009 (wiring rules).

5.13.5.4 Where the existing wall box is an integrated broadband/telephony wall box

The integrated coaxial/telephony wall box (now obsolete) is illustrated in Figure 50.

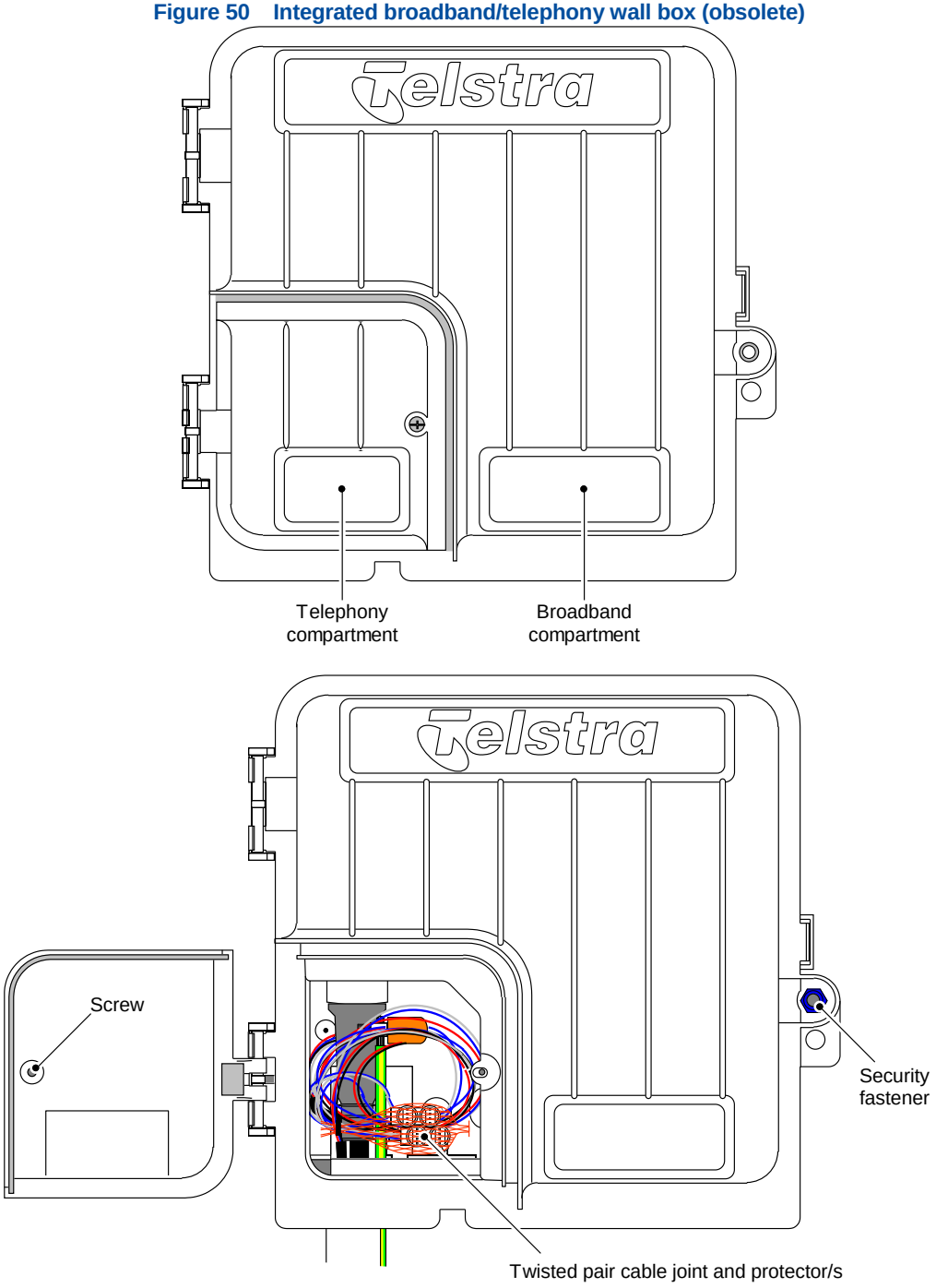
The Telstra NTD must be mounted above, below or beside the broadband box, depending on the height of the wall box and any other restricting factors.

All twisted pair cable should be removed from the broadband box. However, if the lead-in cable won't reach the NTD, the telephony compartment of the box may be used as a jointing box to extend the lead-in cable to the NTD. Any CLP in the broadband box shall be removed and the equipotential bonding (earthing) conductor extended to the NTD using earthing conductor jointing techniques, if necessary, described in Australian Standard AS/CA S009 (wiring rules).

Any cabling that will be connected on the customer side of the NTD **shall** be removed from the broadband box — even if this means running new cables. If it is necessary to join such cabling, it shall be joined in a separate jointing box.

Do not touch any coaxial cable connectors, isolators or splitters within the broadband box, as these are "live" and may be at a hazardous voltage under fault conditions. Because of this potential hazard, only suitably trained persons are permitted to access the broadband compartment of the wall box.

Figure 50 Integrated broadband/telephony wall box (obsolete)



Notes:

1. Access to the twisted pair cable connections is via the smaller lid. Normal telephony installers should not be able to touch any metallic coaxial connectors or broadband components contained in the box behind the larger lid.
2. The broadband compartment must only be accessed by a suitably trained person, as metallic components may be at a hazardous voltage under fault conditions.
3. If unavoidable (e.g. insufficient slack in the lead-in cable), the telephony compartment may be used for joining the lead-in cable to extend it to the Telstra NTD. However, any cables that will be connected on the customer side of the NTD **shall** be removed even if this necessitates running new cables. Any CLP shall also be removed from the broadband box and the equipotential bonding (earthing) conductor extended to the NTD using earthing conductor jointing techniques, if necessary, described in Australian Standard AS/CA S009 (wiring rules).

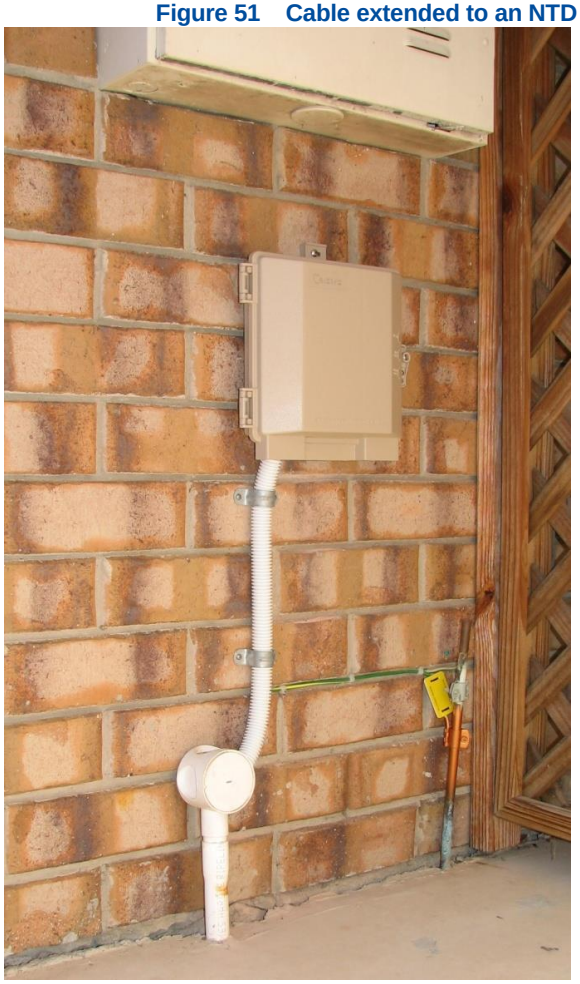
5.13.5.5 Where an existing connection box is too low or too high

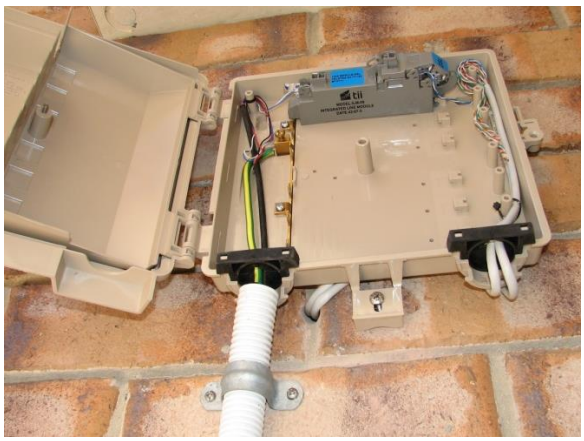
Where the bottom of the existing connection box is less than 500 mm or more than 1300 mm from finished ground level, the cabling shall be extended from the existing connection box or building entry point to the Telstra NTD, which shall be located at a readily accessible height (between 500 mm and 1300 mm from the ground measured to the bottom of the NTD).

If necessary, leave the existing connection box in place as a jointing box and run new cable from this box to the NTD, as shown in Figure 51. Alternatively, it may be possible to remove the existing connection box and extend the cables to the NTD. Figure 52 shows an example of where there is enough slack in the existing cables to reach the NTD.

In some cases, it may be necessary to provide a new connection box to join the cable/s. Lead-in cable and customer cable should be separated so that non-Telstra cabling providers are not required to access Telstra lead-in jointing boxes to access customer cabling. This may mean that two jointing boxes are required (one for the lead-in cable and one for the customer cable) as shown in Figure 53.

Figure 51 Cable extended to an NTD from an existing (obsolete) junction box



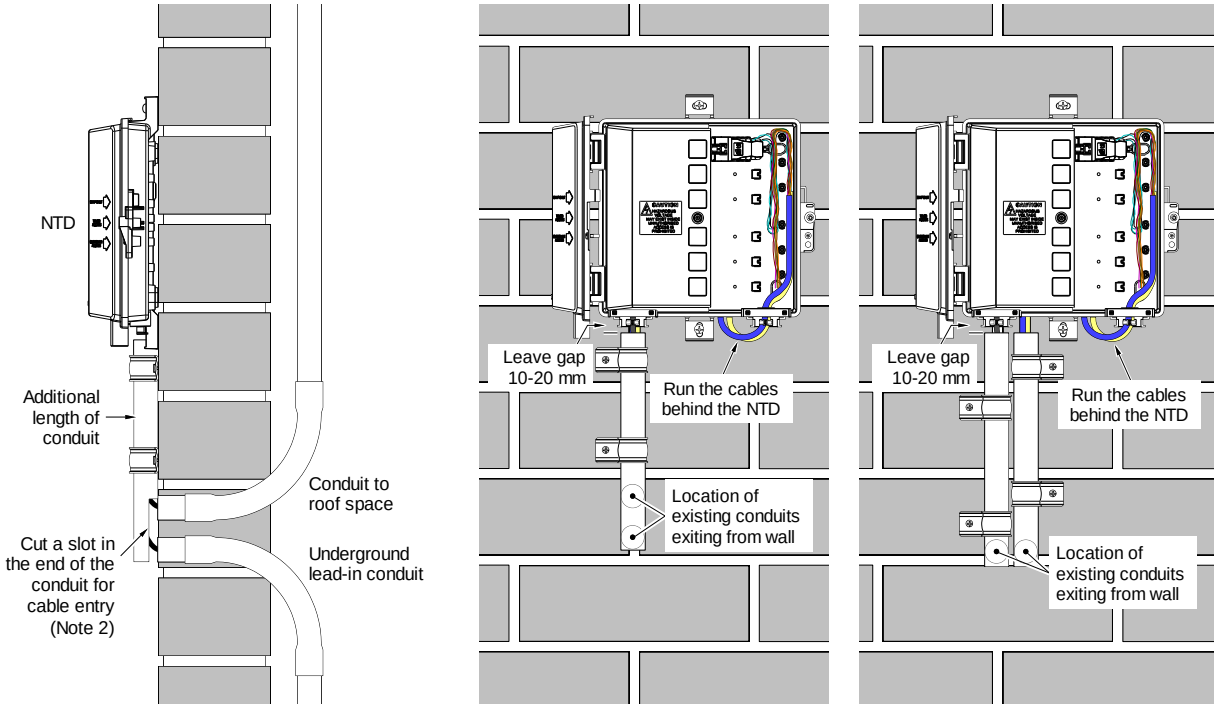


Notes:

1. The round jointing box shown is an old sealed CAN (“Aussie Duct”) junction box.
2. UV stabilised corrugated conduit may be used on the surface of walls but shall be secured at suitable intervals to minimise buckling of the conduit for aesthetic reasons (see 5.13.4.4 on page 52 for the required conduit fastening intervals).
3. In the above case, the indoor cabling may be redirected to the NTD within the wall cavity or via the corrugated conduit. Either the lead-in cabling or the customer cabling may pass behind the NTD to reach the appropriate cable entry port, as shown in the photograph at right.

Figure 52 Retrofitting an NTD where the building entry point is too low (concealed conduits)

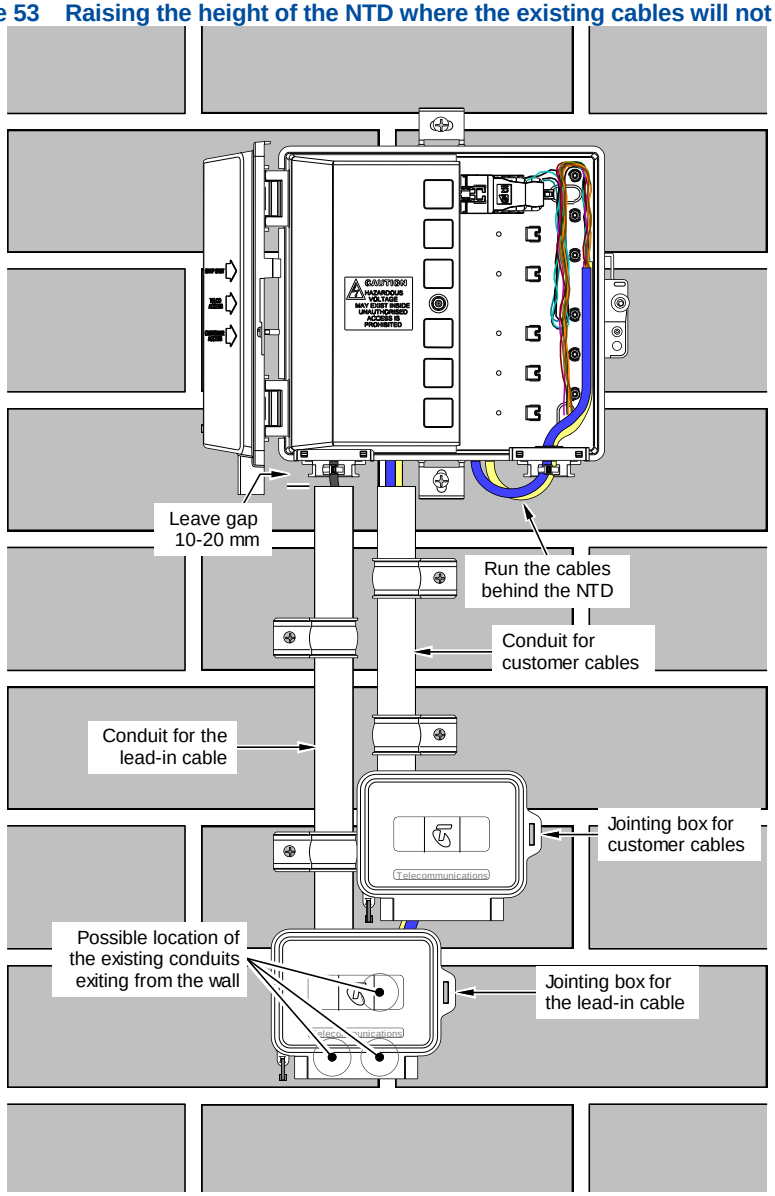
One conduit above the other **Conduits side by side**



Notes:

1. It may be necessary to extend the existing lead-in conduit to install the NTD at the required height. Where the conduits exit the wall one above the other, the lead-in cable and the indoor cable (to be connected on the customer side of the NTD) may be run inside the same conduit to the NTD. Where the conduits exit the wall side by side, separate conduits will be required to extend the lead-in cable and the customer cable to the NTD.
2. Cut a slot in the back of the conduit extension, as shown above left, for the cables. The depth of the slot cut in the end of the conduit for cable entry should be at least 10 mm to allow inspection for termite activity from each side of the conduit.
3. Where the existing cable won't reach the NTD, install one or two jointing boxes, as required, to extend the cabling (see Figure 53). Separate jointing boxes should be used for lead-in cable and customer cable.

Figure 53 Raising the height of the NTD where the existing cables will not reach



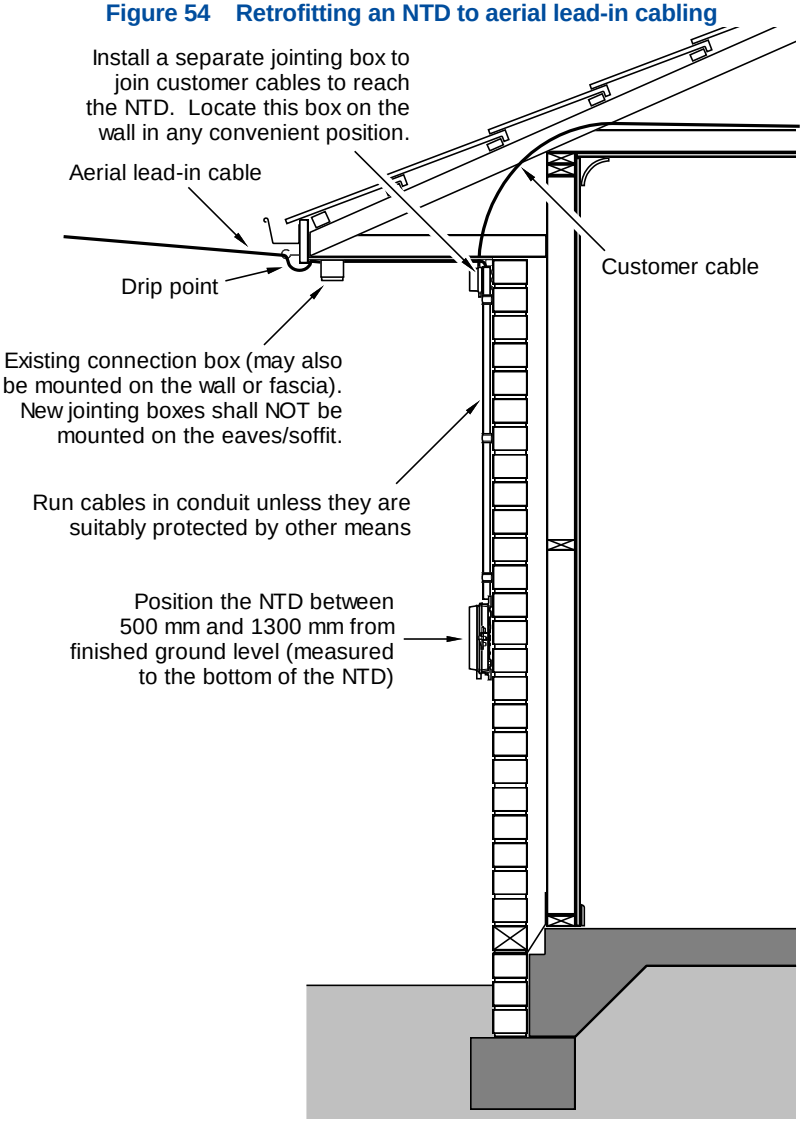
Notes:

1. Separate jointing boxes should be used for joining lead-in cables and customer cables. Holes shall **not** be drilled in the rear, top or side of the jointing box.
2. Where the conduits exiting from the wall are side by side, the jointing boxes may be mounted side by side if preferred.
3. An existing connection box may be re-used as a jointing box if it is serviceable.
4. The lead-in conduit shall **not** be covered by the base of the jointing box. Align the bottom of the cover skirt on the jointing box with the bottom of the conduit to allow inspection for termite activity.

5.13.5.6 Aerial lead-in cabling

Where aerial lead-in cable has been used, there will usually be insufficient lead-in cable to reach the Telstra NTD. It will be necessary to leave the existing connection box/block in place (or install one if one doesn't already exist) for the purpose of joining an additional length of cable to the existing lead-in cable. Redirect or re-run the customer cable to the NTD. If necessary, use a separate jointing box for the customer cabling. See Figure 54. Any existing CLP shall be relocated to the NTD.

Figure 54 Retrofitting an NTD to aerial lead-in cabling



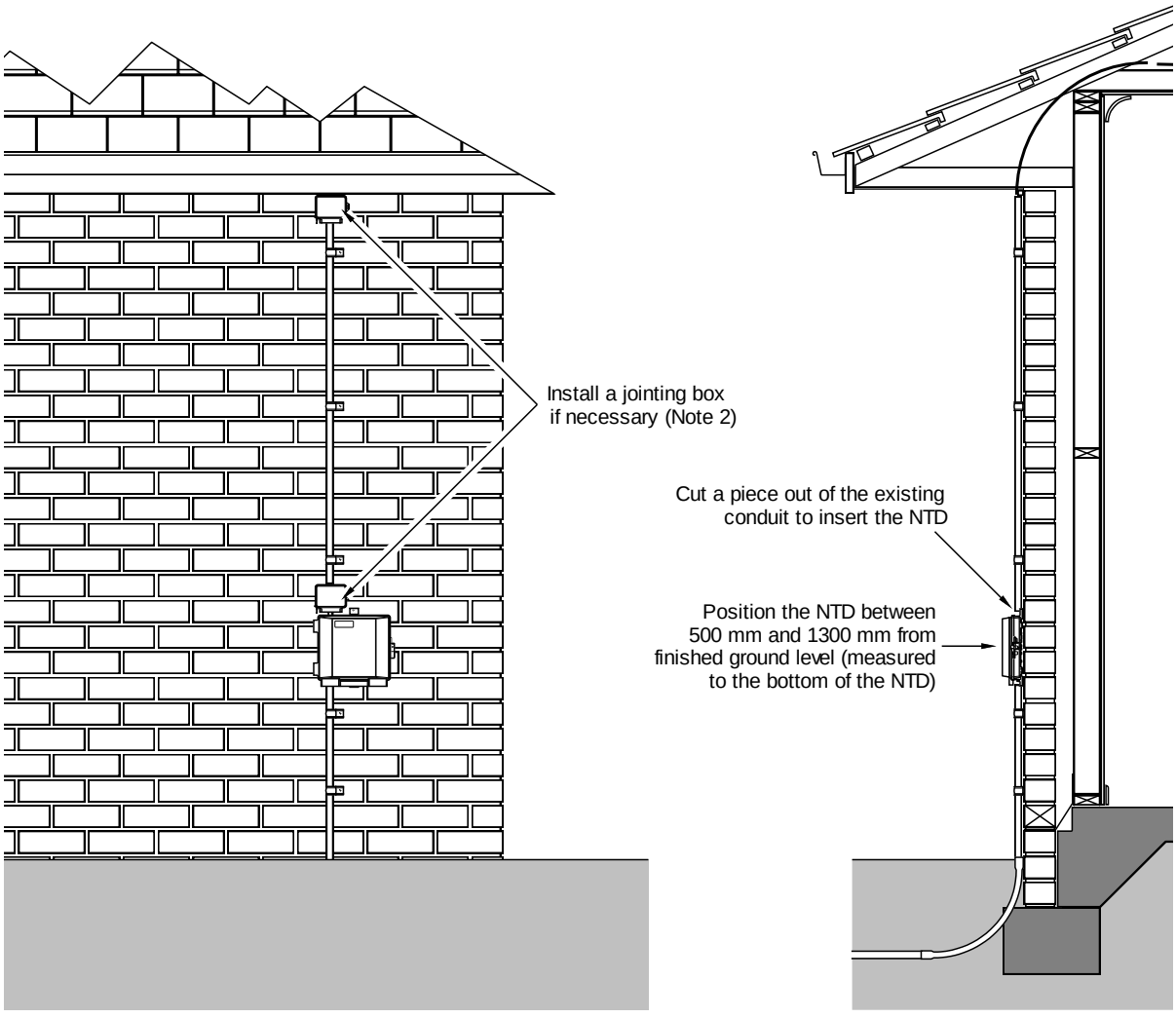
Notes:

1. Leave the existing lead-in connection box/block in place (or install one if one doesn't already exist) for joining an extra length of lead-in cable to reach the NTD. Run the new length of surface cable to the NTD. Use conduit for lead-in cabling running down the wall to the NTD. Up to two customer cables may also use this conduit (see 5.13.4.4 on page 52).
2. For a tiled roof where roof sarking has not been installed, you may be able to slide back a roof tile to access the existing customer cable in the eaves (if necessary). Follow correct safety procedures when working on a ladder or at the roofline. Where the existing customer cable will not reach the NTD, use a separate jointing box to join an additional length of cable.
3. The NTD must be located such that it can be safely accessed without a ladder. Under no circumstances is the NTD to be mounted higher than 1300 mm (measured to the bottom of the NTD).

5.13.5.7 No existing box but the lead-in cable is accessible on the external wall

Where the lead-in cable has been run on the surface of the wall to the eaves or other elevated building entry point, simply insert the NTD in the cabling at a suitable height. If there is insufficient slack cable in the wall or roof to terminate on the NTD, join an extra length of cable on the customer side of the NTD and/or, if necessary, the Telstra side of the NTD using a jointing box. Refer to Figure 55.

Figure 55 Retrofitting a Telstra NTD to surface-run underground lead-in cable



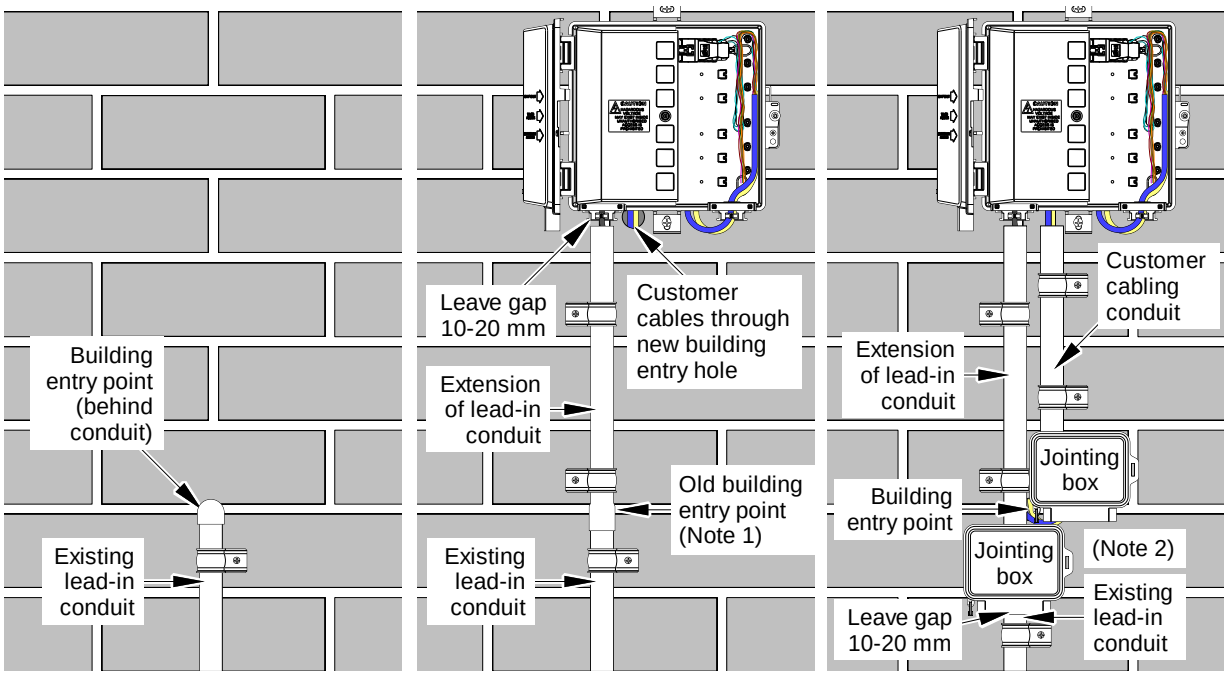
Notes:

1. Cut a suitable section out of the existing conduit to insert the NTD, taking care not to damage the cable inside. If possible, draw down about 300 mm of cable from the roof space.
2. If sufficient slack cable is not available, cut away extra conduit above the NTD to install a jointing box above the NTD and join an extra length of cable on the customer side of the NTD. Alternatively, install the jointing box directly under the eaves.
3. The NTD must be located such that it can be safely accessed without a ladder. Under no circumstances is the NTD to be mounted higher than 1300 mm or lower than 500 mm (measured to the bottom of the NTD).

Where the existing lead-in cable enters the building near ground level, it will usually be necessary to join an additional length of conduit onto the existing lead-in conduit to install the NTD at the required height.

Where the existing cable won't reach the NTD, install a jointing box or, if necessary, two jointing boxes to extend the cable/s to the NTD. See Figure 56.

Figure 56 Retrofitting an NTD where the building entry point is too low



Notes:

1. The lead-in conduit should be contiguous to the NTD without any holes or cut-outs to prevent the covert entry of termites via the underground conduit to the building entry hole. If customer cables are to be run through the existing building entry hole, run a separate conduit for these cables between the NTD and the building entry hole as shown at right.
2. A jointing box may not be required if there is sufficient slack cable available to reach the NTD.

5.13.5.8 No existing box but the lead-in cable is accessible under the floor

Where the existing lead-in cable runs under the building, check for slack cable under the building to avoid the need for any additional cable joints.

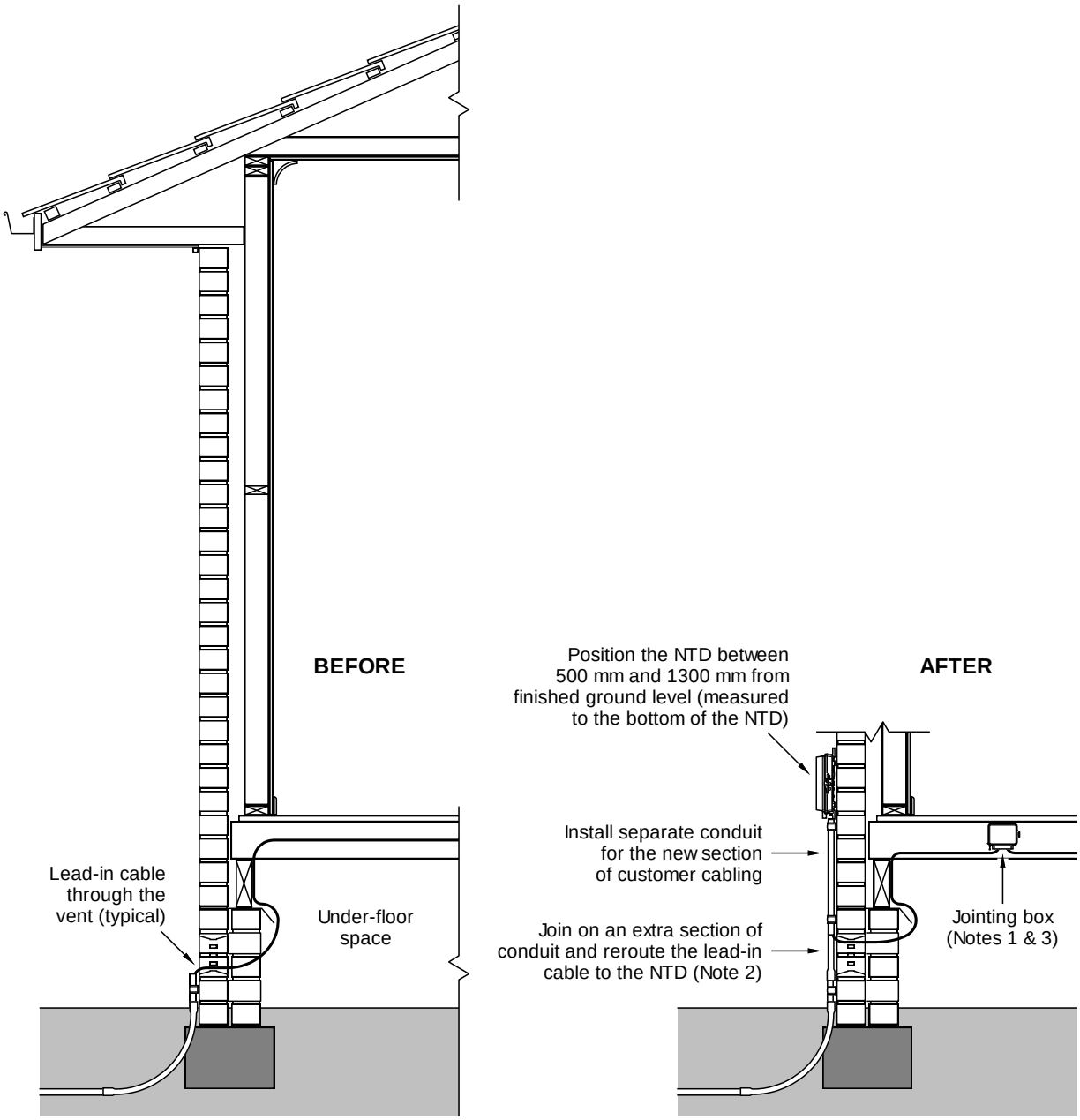
If sufficient slack cable is not available, cut the lead-in cable under the floor, leaving sufficient length to reach the NTD. Bring the lead-in cable out to the wall of the building and terminate it on the NTD. Join an extra length of cable onto the cable to be connected on the customer side of the NTD. Locate any jointing box under the floor in an accessible location. Refer to Figure 57.

Follow correct safety procedures when working in under-floor crawl spaces.

If it is necessary to join extra cable to the lead-in cable, use separate jointing boxes for the lead-in and customer cables.

If the under-floor space is inaccessible or it is considered to be unsafe to access, install the NTD in accordance with Figure 56.

Figure 57 Retrofitting an NTD where the lead-in cable is accessible under the floor



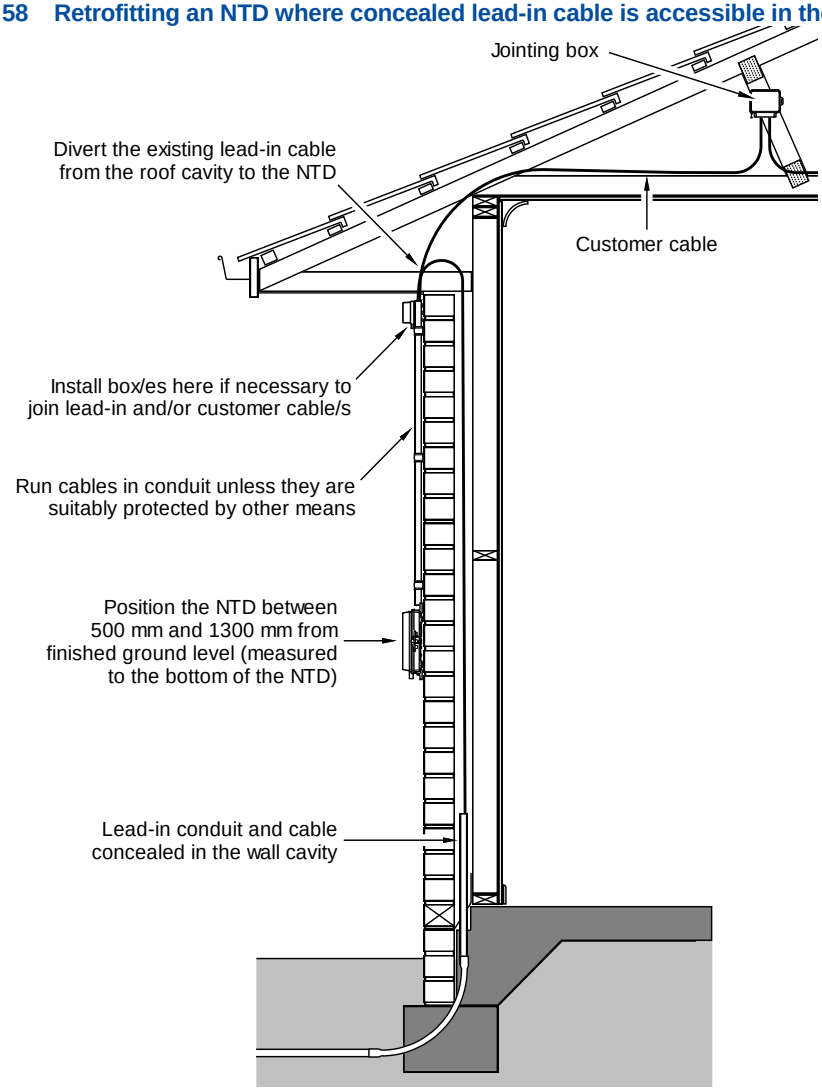
Notes:

1. Check for slack cable under the house before cutting the lead-in cable and installing additional joints.
2. If sufficient slack cable is not available, cut the lead-in cable under the floor at a point near where the jointing box will be installed, ensuring that there is sufficient lead-in cable to reach the NTD. Join an extra section of conduit onto the existing lead-in conduit to extend it to the NTD (remember to leave a 10-20 mm gap between the end of the conduit and the base of the NTD).
3. Install a jointing box on a bearer or joist in an accessible location under the floor. Run an extra section of cable between the customer side of the NTD and the jointing box and join all pairs through to the existing cable that runs to the first telecommunications outlet.
4. If it is unsafe to enter the under-floor space or it is inaccessible, install one or two jointing boxes, as required, at the building entry point as shown in Figure 56.

5.13.5.9 No existing box but the lead-in cable is accessible in the roof

If the lead-in cable can be safely accessed in the roof space, bring the lead-in cable out to the wall via the eaves. If necessary, install one or two jointing boxes in an accessible part of the roof space to extend the lead-in and customer cables down the external wall of the building to the NTD. Avoid installing jointing boxes if there is sufficient slack cable in the roof space or in the pit to reach the NTD.

Figure 58 Retrofitting an NTD where concealed lead-in cable is accessible in the roof



Notes:

1. If sufficient slack cable is not available in the roof space to reach the NTD, cut the lead-in cable in the roof at a point near where the jointing box will be installed, ensuring that there is sufficient lead-in cable to reach the NTD. Redirect the existing lead-in cable to the NTD. If the cable won't reach, install a jointing box on the wall under the eaves. Use conduit for lead-in cabling running down the wall to the NTD. Up to two customer cables may also use this conduit.
2. Install a jointing box on a vertical roof member in an accessible location in the roof. Run an extra section of cable between the customer side of the NTD and the jointing box and join all pairs through to the existing cable that runs to the first telecommunications outlet.
3. For a tiled roof where roof sarking has not been installed, you may be able to slide back a roof tile to access the existing cables in the eaves (if necessary). Follow safe practices when working on a ladder or at the roofline.
4. The NTD must be located such that it can be safely accessed without a ladder. Under no circumstances shall the NTD be mounted higher than 1300 mm or lower than 500 mm (measured to the bottom of the NTD).

5.13.5.10 Lead-in cable totally concealed and only accessible at the first TO

There will be cases where the lead-in cabling is totally concealed and inaccessible, except at the first telecommunications outlet. Figure 59 shows an example of an existing installation where the lead-in cabling may be inaccessible (in this case, a two-storey building not cabled in accordance with current Telstra practices). In other cases, the lead-in conduit may run through the floor slab to an internal wall from where the cable runs inside the wall to the first telecommunications outlet.

In all cases where the lead-in cable is inaccessible, there are cost and safety risks associated with retrofitting an NTD, and the need for an NTD for that particular installation may need to be reviewed. Where it is determined that an NTD is essential, it may be necessary to use a suitable cable locator to find and intercept the lead-in cable at the building.

The NTD shall **not** be installed inside the building under any circumstances.

Note: The NTD contains inbuilt lightning protection, which may ignite or explode under extreme surge conditions.

Where cable location techniques indicate that the lead-in cable may be accessible in the wall cavity, it may be possible — subject to the permission of the building owner — to make a hole in the internal wall and "fish" the cable out of the cavity. Where the cable is successfully "fished" out of the cavity from the internal wall, a hole may then be drilled (at a downward angle) through the external wall cladding from the inside to an external NTD.

Note: Any hole made in the internal wall should be no larger than 75 mm x 50 mm so that it can be covered by a standard wall plate.

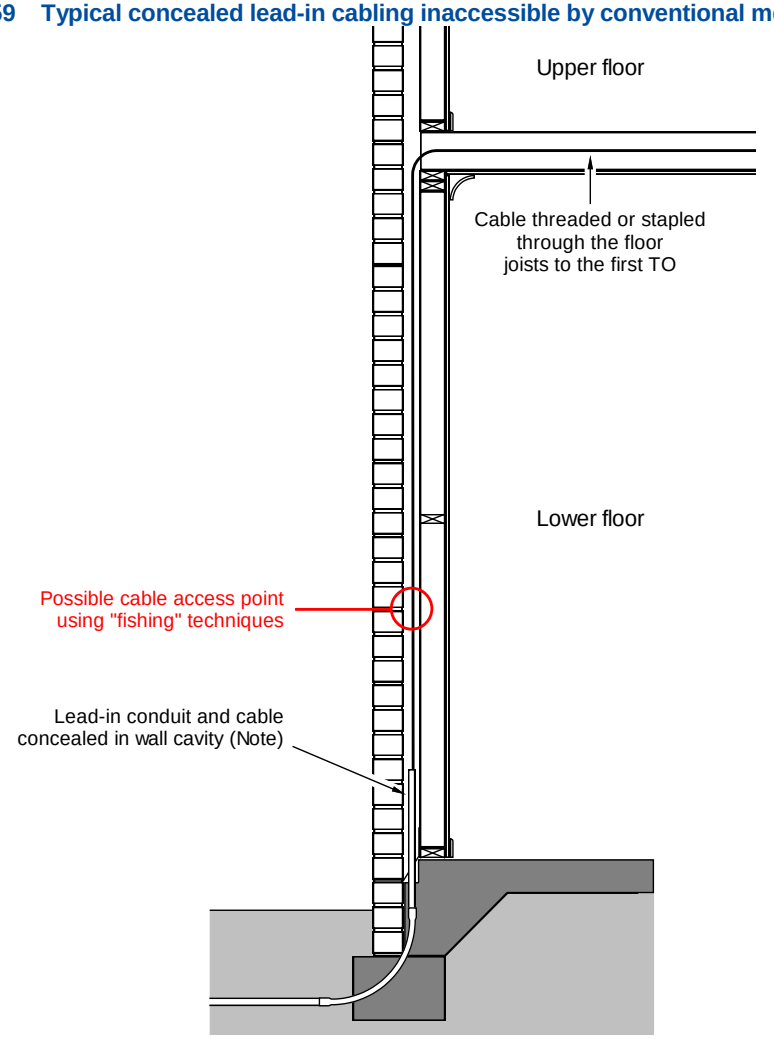
In some cases, there may be insufficient slack cable in the building cavities, or the conduit may extend too far up the wall cavity, to enable the cable to be retrieved. This possibility needs to be considered before proceeding.

Due to the likely presence of power cables, it is essential that safe work practices be applied whenever "fishing" wall cavities, including the following:

- Switch off the power to the building at the main electrical switchboard (note that this will not disconnect power fed to the switchboard from the street mains). Use a cordless electrical drill to drill the wall.
- Wear personal protective equipment (insulating gloves, insulating mat and long-sleeved coveralls) when drilling or fishing walls.
- Ensure that you are not touching any metal object (e.g. downpipe) or earthed object (e.g. masonry wall) with any part of your body when drilling or fishing walls.
- When drilling the wall, do not hold the metal gear case or chuck of the drill (only grasp it by the insulated handgrips), and only drill to the depth of the wall cladding. Drill the hole through the external wall cladding at an angle such that rainwater won't enter the wall cavity via the hole.
- Only use non-conductive cable hooks or snares.

Where the lead-in cable cannot be retrieved from the wall cavity and an NTD is still required, it may be necessary to abandon the existing cabling and get the underground lead-in cabling re-installed by Telstra (charges apply).

Figure 59 Typical concealed lead-in cabling inaccessible by conventional means



Note: The conduit inside the wall may run several metres above the floor level, which will make the cable even more difficult to retrieve from the wall cavity.

6 NTD TESTING AND REPAIR

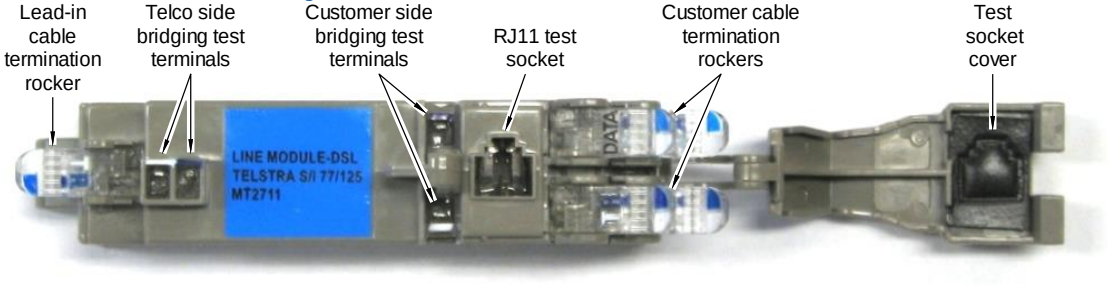
6.1 Test facilities

The Telstra NTD does not have remote line isolation and testing facilities or a distinctive test “signature”. Such features were investigated during NTD development but a viable solution was not found.

Manual, on-site testing is supported by several features on the line module. Each module has a test socket and two pairs of bridging test terminals. In addition, the cable termination rockers support simple disconnection and reconnection of cable pairs. Refer to Figure 60.

Schematic circuit diagrams of the line modules are provided in Figure 62.

Figure 60 Test facilities on the NTD line module



6.2 Test socket

The test socket automatically isolates the customer cabling and connects the incoming line to the socket contacts when a plug is inserted. The test socket may be used by the customer, cabling provider or service provider to conduct preliminary testing of the DSL or telephone service. Refer to Figure 61.

The test socket does not provide a conclusive test result. Testing must be verified by the cabling provider, service provider or Telstra in case the line module is faulty. If the service does not work at the test socket, test the service at the "Telco" side bridging test terminals and/or the disconnected lead-in cable pair. If the service works at the test socket, test the service at the customer side bridging test terminals and/or the customer cable termination rockers.

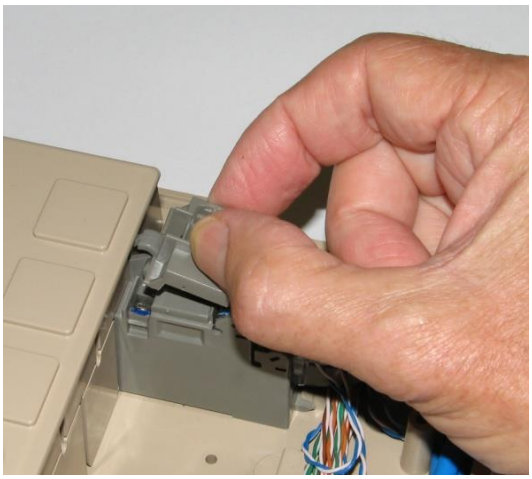
Notes:

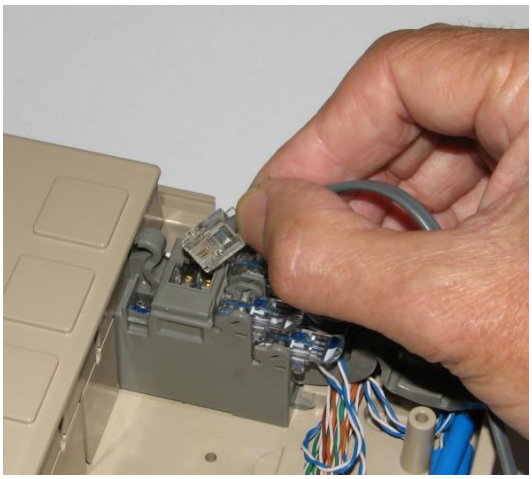
1. Customer testing at the NTD is voluntary — Telstra does not require the customer to test the service at the NTD. However, by doing so the customer may expedite the repair process or avoid an incorrect call-out charge (e.g. if the customer's cabling or equipment is faulty). Instructions for use of the test socket are included on the inside of the NTD cover (see Figure 61).
2. Telstra opted to use a 6P modular (RJ11) test socket instead of an 8P modular (RJ45) socket in the NTD to reduce the risk of a customer plugging an Ethernet device into it (e.g. VOIP telephone, portable PC) and receiving an electric shock or damaging the Ethernet device. Most or all modern telephone equipment and DSL modems are supplied with a line cord terminated on a 6P modular (RJ11) plug.

Telstra may install network devices on the Telstra side of the NTD for certain purposes (e.g. RF interference filters, remote isolation devices). The cabling provider shall **not** disturb any such device.

Figure 61 NTD line module test socket

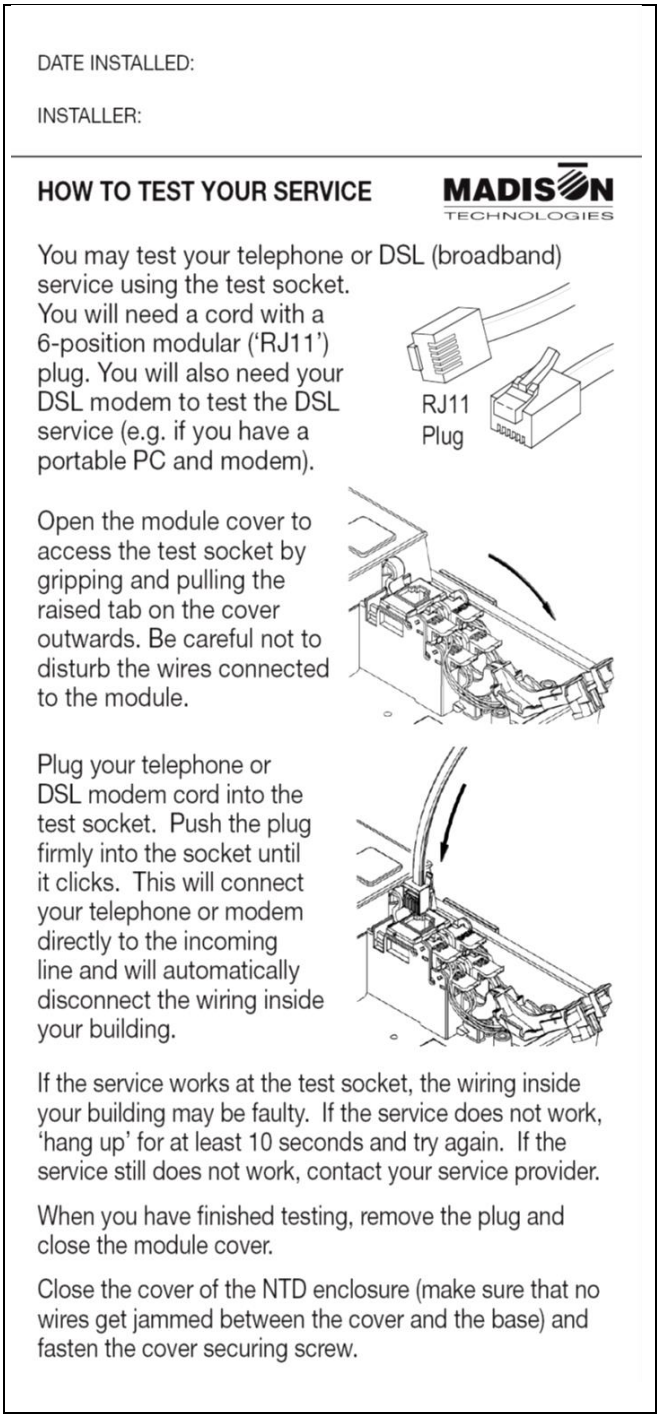
Using the test socket **Instruction label inside the NTD cover**





Notes:

1. To access the test socket, open the hinged cap with your fingers.
2. Connect your buttinski or other test equipment by pushing the plug firmly into the socket until it locks. Some force is required to operate the contacts that disconnect the customer cabling.
3. If the service works, remove the plug and test the service at the customer side bridging test terminals and at the cable connection rockers to confirm that the contacts in the test socket or connections in the module are not faulty.



DATE INSTALLED:

INSTALLER:

HOW TO TEST YOUR SERVICE MADISON TECHNOLOGIES

You may test your telephone or DSL (broadband) service using the test socket. You will need a cord with a 6-position modular ('RJ11') plug. You will also need your DSL modem to test the DSL service (e.g. if you have a portable PC and modem).

RJ11 Plug

Open the module cover to access the test socket by gripping and pulling the raised tab on the cover outwards. Be careful not to disturb the wires connected to the module.

Plug your telephone or DSL modem cord into the test socket. Push the plug firmly into the socket until it clicks. This will connect your telephone or modem directly to the incoming line and will automatically disconnect the wiring inside your building.

If the service works at the test socket, the wiring inside your building may be faulty. If the service does not work, 'hang up' for at least 10 seconds and try again. If the service still does not work, contact your service provider.

When you have finished testing, remove the plug and close the module cover.

Close the cover of the NTD enclosure (make sure that no wires get jammed between the cover and the base) and fasten the cover securing screw.

6.3 Bridging test terminals

The "Telco" side bridging terminals are connected across the lead-in cable termination rockers. These terminals may be used to:

- monitor or test the DSL service or the telephone service with all cabling connected; or
- verify operation of the DSL service, telephone service or lead-in cabling connections with the customer cabling isolated by inserting a plug into the test socket.

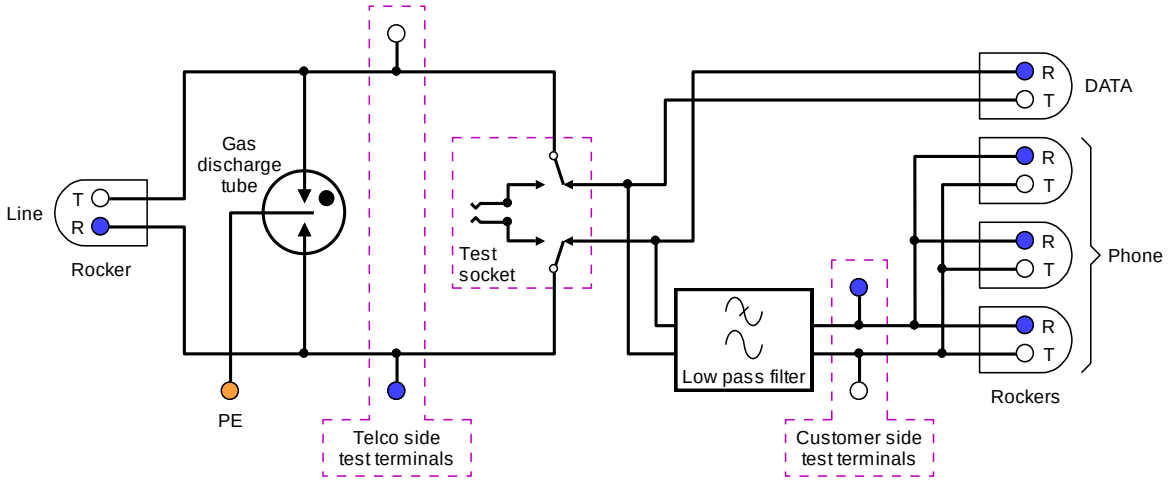
The customer side bridging terminals are connected across the telephone cable termination rockers. This means that they are connected on the telephone side of the central filter in the DSL module and are disconnected from the incoming line when a plug is inserted into the test socket. These terminals may be used to:

- monitor or test the telephone service with all cabling connected; or
- test the telephone cabling and connections with the service isolated by inserting a plug into the test socket.

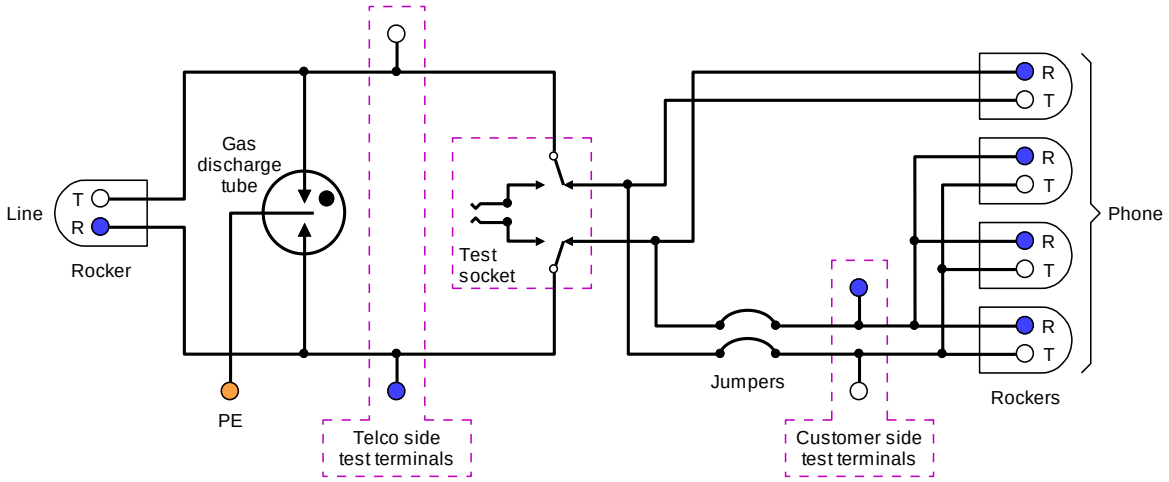
Note: In the DSL module, the central filter will still be connected across the bridging terminals in this configuration. See Figure 62 (a).

Figure 62 Schematic circuit diagrams of the line modules

(a) DSL line module



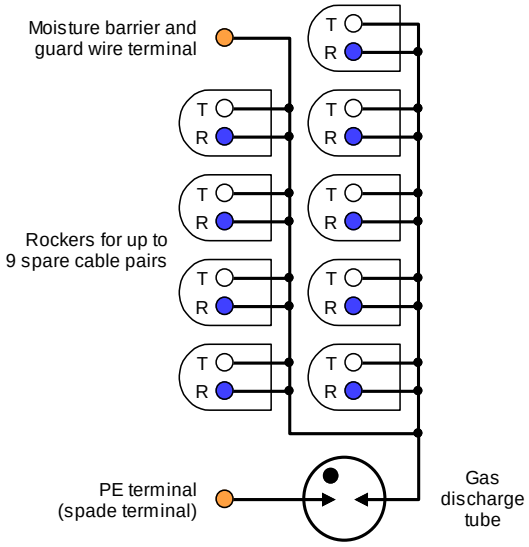
(b) Standard line module



Notes:

1. Insertion of a plug into the test socket automatically operates changeover contacts that disconnect the customer side of the module and connect the line to the test socket contacts.
2. The changeover contacts are robust to withstand line surges. They are also gold plated to avoid the need for contact wetting current to maintain the integrity of the contact if no DC voltage is present.

Figure 63 Schematic circuit of the rural cable connection module



Notes:

1. All spare cable pairs, the cable moisture barrier (foil) and guard wire (if provided) are connected to the module and are bonded via an inbuilt differential earth clamp (gas discharge tube) to the protective earth (PE) terminal which connects to the earthing bar in the NTD.
2. The purpose of this module is to protect the lead-in cable from lightning damage by “clamping” all metallic cable elements to ground under overvoltage (surge) conditions, thus reducing dielectric stress within the cable and lowering the risk of insulation breakdown.

6.4 Repair of the NTD

Apart from the line modules, there are no replaceable parts for repair of the NTD. If any part of the NTD enclosure is faulty, the entire enclosure must be replaced or the required parts must be scavenged from a spare enclosure (e.g. cable entry grommet, earthing bar, cover, locking screws).

Any faulty NTD components will usually be replaced by Telstra at Telstra’s cost unless damaged due to customer or third party negligence or the component is not associated with the supply a retail Telstra service (e.g. a DSL line module installed on an Unconditioned Local Loop Service by another service provider), in which case Telstra charges may apply.

7 REFERENCES

Document number	Title
Telstra Document No. 012882	Alteration of Telstra facilities in homes & small businesses — Information for cabling providers
Telstra Document No. 013234	Cabling of new homes for Telstra FTTP — Information for builders and cabling providers
Telstra Document No. 017153a00	Cabling of premises for telecommunications — A complete guide to home cabling
Telstra Document No. 017153a01	Cabling of premises for telecommunications — Essential information for home cabling
Telstra Document No. 017153a02	Cabling of premises for telecommunications — Lead-in cabling and building entry facilities for homes
Telstra Document No. 017153a08	Cabling of premises for telecommunications — Telstra requirements for customer MDFs
Australian Standard AS/CA S009	Installation requirements for customer cabling (Wiring rules)
Australian/New Zealand Standard AS/NZS 1768	Lightning protection
Australian Standard AS 4262.1	Telecommunications overvoltages Part 1: Protection of persons
Australian Standard AS 4262.2	Telecommunications overvoltages Part 2: Protection of equipment
Australian/New Zealand Standard AS/NZS ISO/IEC 15018	Information technology — Generic cabling for homes
Standards Australia Handbook HB 252	Communications Cabling Manual Module 3: Residential communications cabling handbook

8 DEFINITIONS

Term	Definition
6P	Six-Position — the physical contact capacity of modular sockets and plugs commonly used for analogue telecommunications connections. These are often (incorrectly) described as “RJ11” or “RJ12”.
8P	Eight-Position — the physical contact capacity of modular sockets and plugs commonly used for digital telecommunications connections. These are often (incorrectly) described as “RJ45”.
A2A	“Authorisation to Alter” (Telstra Document No. 012882)
ACMA	Australian Communications and Media Authority (formerly AUSTEL, then ACA) — the telecommunications industry regulator responsible for technical regulation (e.g. governance of compliance labelling, cabling provider registration, mandatory technical standards for customer equipment, and wiring rules)
ACMA-compliant	Complies with technical standards made by the ACMA, specifically Australian Standard AS/CA S008, *Requirements for customer cabling products*, and its predecessors
ADSL	Asymmetric Digital Subscriber Line — a form of DSL that has different upstream and downstream data transfer rates. The original form of ADSL is sometimes referred to as ADSL1. Faster versions are ADSL2 and ADSL2+. See also “DSL” and “VDSL”.
AS	Australian Standard
AS/CA (Australian Standard/ Communications Alliance)	An Australian standard developed and produced by Communications Alliance (formerly ACIF)
AS/NZS (Australian/New Zealand Standard)	A joint Australian/New Zealand Standard prepared by representatives from each country and which includes requirements common to each country
AWG	American Wire Gauge
bonding	See “equipotential bonding”
broadband	A general term used to describe signal transmission at a bandwidth higher than the normal voice bandwidth, e.g. high-speed data services and television services
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
cabler	See “cabling provider”
cabling	Cable or cables and any associated works or parts such as pits, poles, conduits, trays, connecting devices, jumpers, etc.

Term	Definition
cabling provider	A person registered as a cabling provider under the *Cabling Provider Rules*
Cabling Provider Rules	The *Telecommunications Cabling Provider Rules 2000*
cabling work	Section 7 of the *Telecommunications Act 1997* defines cabling work as: • the installation of customer cabling for connection to a telecommunications network or to a facility; or • the connection of customer cabling to a telecommunications network or to a facility; or • the maintenance of customer cabling connected to a telecommunications network or to a facility.
Category 5 (or “5e”)	Cable or connecting hardware that is designed and manufactured to carry signals with a nominal maximum frequency of 100 MHz
Category 6	Cable or connecting hardware that is designed and manufactured to carry signals with a nominal maximum frequency of 250 MHz
central/centralised filter/splitter	A filter designed to pass signals in the voice band and block signals above the voice band, for connection in series with all telephone equipment connected to a line used to supply a digital subscriber line (DSL) service
CLP	Customer Lightning Protection — the term Telstra uses for surge suppression provided for the protection of the end-user of a telecommunications network service
C/O switch	Changeover switch — a switch used to connect a line to either one point (e.g. a telecommunications outlet) or another
conduit	A tube or pipe that physically accommodates cables
conduit half-saddle	A clip used for securing conduit that is fastened by a single nail or screw on one side of the clip only
conduit saddle	A clip used for securing conduit that is fastened by a nail or screw on each side of the clip
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 network boundary
customer equipment	Any equipment connected on the customer’s side of the network boundary
DEC	Differential Earth Clamp — a gas-filled discharge tube (“protector”) used to bring two points to nearly equal potential under overvoltage conditions
distributor	A collection of components used to terminate cables and which provides facilities for cross-connection by means of jumpers or patch cords

Term	Definition
DSL	Digital Subscriber Line — a type of telecommunications network service that allows connectivity to digital services (e.g. the internet) via a standard telephone line while allowing simultaneous operation of the telephone service connected to that line. This abbreviation is used to describe all types of digital subscriber line (DSL), e.g. Asymmetric DSL (ADSL), Business (symmetric) DSL (BDSL), Very high rate DSL (VDSL). The abbreviation “xDSL” is also commonly used and has the same meaning.
ducting	See “trunking”
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”.
eaves	The underside of a roof projecting beyond the external wall face that is usually lined with sheeting (also called a “soffit”)
emergency call	See “personal response system”
equipotential bonding	Bonding (connecting) two or more earthing systems or earthed parts together to ensure that they are at approximately “equal potential”
fascia (board)	A vertical board immediately below the roof line that is fixed to the ends of the roof rafters and which provides support for the roof gutter
fibre/fiber	See “optical fibre”
first socket	That socket within a building that terminates Telstra’s lead-in cable. There may be more than one first socket within a building (e.g. multiple lines). The first socket is a defined network boundary point.
first TO	The telecommunications outlet (TO) that contains the first socket
FOXTEL	The major provider of pay TV services in Australia (partly owned by Telstra)
FTTP	Fibre To The Premises — a telecommunications network technology in which services are supplied to the customers’ premises via optical fibre
G/Y	Green/Yellow — the insulation colour for earthing/bonding conductors
half-saddle	See “conduit half-saddle”
HD	Home Distributor (see “distributor”)
high voltage (HV)	See “HV”
home networking	Cabling within a home that is capable of being used to link (“network”) several personal computers — see “structured cabling”

Term	Definition
HV	High Voltage — a voltage exceeding 1000 V AC or 1500 V DC
indoor	Installed inside a building but not underground (e.g. installed beneath a concrete slab) or exposed to the weather
internet	A global system of interconnected computer networks that provides consumers and businesses access to the World Wide Web (WWW) and which provides the infrastructure to support electronic mail (email)
ISO/IEC	International Standardisation Organisation/International Electrotechnical Commission — used to prefix a standard or other document developed jointly by both organisations
isolation box	An outdoor enclosure that houses a coaxial cable isolator which is used to isolate any HFC network voltage and earthing system from any voltage and earthing system used in the customer's premises
jumper	A cable unit or cable element without connectors (e.g. a pair of wires) used to make a cross-connection within a distributor
KRONE	The brand of Telstra's standard lead-in termination modules for customer MDFs (manufactured by TE Connectivity)
lead-in cabling	A carrier's (e.g. Telstra's) cabling from the last distribution point (typically in the street) and the network boundary in the customer's premises
line	In this Document, this means a pair of wires used to supply a network service such as telephone, DSL, ISDN or unconditioned local loop (ULL) services
low-pass filter	A filter that is designed to block higher frequencies (e.g. above the voice band) and pass lower frequencies
low voltage (LV)	See "LV"
LV	Low Voltage — a voltage exceeding 42.4 V peak (about 30 V AC r.m.s. for a sine wave) or 60 V DC but not exceeding 1000 V AC or 1500 V DC
m	metre or metres
Madison	Madison Technologies — the manufacturer of Telstra's standard wall boxes and the network termination device described in this document
Main Distribution Frame	See "MDF"
max.	maximum
MBHJC cable	Moisture Barrier Hard Jacket Composite
MDF	Main Distribution Frame — a distributor that provides an electrical termination point for a carrier's (e.g. Telstra's) lead-in cabling. An MDF is a defined network boundary point.
medical alert	See "personal response system"
min.	minimum

Term	Definition
mm	millimetre/s — one millimetre is one thousandth of a metre
Mode 3	A wiring arrangement (“connection mode”) for a telephone line that allows a certain device to take control of the line to make an important call so that interruption of the call from another telephone access point is prevented
modem	Short for “**mod**ulator/**dem**odulator”, provides an interface between a public telecommunications network line (e.g. a telephone line) and a computer, usually to convert analogue signals to digital signals and vice versa
moisture resistant connector	See “MRC”
MRC	Moisture Resistant Connector — a discrete connector, used for joining two or more conductors, that is filled with a moisture-resistant compound such as grease or gel
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”
Open registration	A class of cabling provider (“cabler”) registration under which the type of customer cabling work that a cabler can legally do is not limited by the nature of the work to be performed. Compare with Restricted registration.
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”.
outdoor	Installed outside a building, including on the external surface of a building or other structure as well as underground or aerial
outlet	Telecommunications outlet (i.e. includes socket/s plus mounting hardware)
patch cord	A flexible cord terminated with plugs to make a cross-connection between sockets within a patch panel or between a socket and equipment

Term	Definition
patch panel	An array of sockets that may be cross-connected by means of patch cords
PE	Protective Earth
PE cable	Polyethylene-sheathed cable (black sheath)
PEHJ cable	Polyethylene-sheathed hard jacket cable (black sheath, more rigid than PE cable)
personal response system (PRS)	Often referred to as a “medical alert” or “emergency call” system, this is a communications system that enables a person with a disability or medical condition to call for assistance by initiating a call to a predetermined number via the telephone network. The call may be initiated by pressing the button on a portable device or on a fixed device located in a room.
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.
pre-wiring	Also described as “roughing in” or “pre-provisioning”, this is the practice of cabling a building during construction to minimise installation costs and maximise concealment of cables
property entry point	The point in a premises where Telstra lead-in cable enters the premises
R (Ring)	A wiring terminal designation widely used in the USA and which is used in some imported Australian equipment, e.g. Telstra’s NTD and wallphone outlet plates. “T” and “R” stand for “Tip” and “Ring”, which is a legacy from a time when corded telephone switchboards were used whereby the leg of each line was designated according to whether it connected to the “tip” or the “ring” of the connecting plug. “T” is the “A” or “+” leg and “R” is the “B” or “-” leg. Line polarity is unimportant with most customer equipment.
readily accessible	Capable of being reached quickly and without climbing over or removing obstructions, mounting upon a chair, using a moveable ladder, and in any case not more than 2 m above the ground, floor or platform
registered cabler / cabling provider	A person who is registered in accordance with regulatory requirements to install or repair customer cabling. See also “Open registration” and “Restricted registration”
Restricted registration	A class of cabling provider (“cabler”) registration under which the type of cabling work that a cabler can legally do is limited according to the nature of the work to be performed. Compare with Open registration.
retrofit	To add equipment some time after the initial installation

Term	Definition
RJ	Registered Jack — a designation introduced by regulators in the USA in the 1970s to specify both a type of socket (jack) and a wiring pattern for connection of customer wiring at the carrier's network interface. This is comparable to "Connection Modes" introduced in Australia around the same time. It has become popular to use certain RJ designations to (incorrectly) describe a physical socket or plug only, e.g. "RJ45" is the popular designation for an 8P modular socket/plug while "RJ11" or "RJ12" is the popular designation for a 6P modular socket/plug.
RJ11/RJ12	Registered Jack No. 11 (or 12) — a term commonly (but incorrectly) used to describe a 6P modular plug or socket
RJ45	Registered Jack No. 45 — a term commonly (but incorrectly) used to describe an 8P modular plug or socket
rural area	An area in which the properties have frontages greater than an average of 60 metres, lot sizes generally larger than 1000 m², and there is usually no curb and channel and no street lighting. The telecommunications network construction is usually characterised by long cable routes with cables buried directly in the ground (i.e. without conduit).
S.	Serial/Item — a material number assigned to products by Telstra
saddle	See "conduit saddle"
SHDSL	Symmetric High-speed Digital Subscriber Line — a form of DSL that has the same upstream and downstream data transfer rates.
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
star wired/wiring	A method of cabling outlets radially from a common point as distinct from cabling outlets sequentially (i.e. from one outlet to another)
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"
surface cabling	Cable that is fastened to the visible surface of a building or structure such as a wall or ceiling
surge suppression	A device or technique used to limit the rise in voltage between two or more parts of a cabling system or within equipment, which may be caused by a lightning discharge or a surge in the power supply system
switch (Ethernet)	A computer networking device that enables multiple Ethernet devices to be interconnected in a local area network (LAN)
switching socket	A type of telephone socket in which certain contacts "make" when the plug is removed, commonly used for "Mode 3" connections

Term	Definition
T (Tip)	A wiring terminal designation widely used in the USA and which is used in some imported Australian equipment, e.g. Telstra's NTD and wallphone outlet plates. "T" and "R" stand for "Tip" and "Ring", which is a legacy from a time when corded telephone switchboards were used whereby the leg of each line was designated according to whether it connected to the "tip" or the "ring" of the connecting plug. "T" is the "A" or "+" leg and "R" is the "B" or "-" leg. Line polarity is unimportant with most customer equipment.
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"
Torx	The trademark for a screw head characterised by a 6-point star-shaped pattern. The Telstra NTD uses a security Torx screw head that contains a post in the centre of the head that prevents a standard Torx driver (or a straight screwdriver) from being inserted
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
underground	Installed below ground level external to a building but not including anything installed within an underground structure such as a service tunnel or mine
UPVC	Unplasticised Polyvinyl Chloride — a material commonly used for the manufacture of rigid plastic conduit
urban area	An area in which the properties have frontages less than an average of 60 metres, lot sizes generally smaller than 1000 m², and the roads usually have curb and channel and street lighting. The telecommunications network cables are usually installed in conduit.
UTP	Unscreened Twisted Pair (or Unshielded Twisted Pair) — twisted pair cable that does not contain a screen/shield
UV	Ultraviolet — the damaging component of sunlight that is invisible to the human eye
V	Volt/s
V AC	Volt/s Alternating Current
V DC	Volt/s Direct Current

Term	Definition
VDSL	Very high rate Digital Subscriber Line — a more advanced DSL technology than ADSL and ADSL+ that uses a higher bandwidth to provided greater data throughput, albeit over shorter distances. Second-generation VDSL (VDSL2) provides theoretical data rates of 100 Mbps simultaneously in both directions but in practice these rates are unrealistic.
VOIP	Voice Over Internet Protocol — a technology that enables voice frequency (e.g. telephone) calls to be made over the internet, usually at a lower cost than conventional long distance telephone calls
wiring rules	For telecommunications cabling, this means Australian Standard AS/CA S009 or its replacement. For electrical cabling, this means Australian/New Zealand Standard AS/NZS 3000.

9 DOCUMENT CONTROL SHEET

Issue number	Issue date	Details on the change
1	11/11/2002	
2	06/05/2003	
3	25/07/2003	
4	17/09/2008	New NTD introduced — completely revised and reissued
5	01/01/2009	Editorial corrections and additions, general update
6	13/05/2009	Enhancement to schematic circuit in Figure 18
7	26/08/2013	General update
8	1/02/2017	Updated document to reflect NTD changes: • Section 3.5.2 - Circumstances under which Telstra may install an NTD – Changed to reflect installation of an NTD will be mandatory on all new installs from 1st March. • Section 5.1 - Cabling arrangement – Changed figures 2, 3, 4 to reflect new network boundary point and advising that any cabling beyond an NTD is the responsibility of the customer. • Section 5.9.5 - Home networking – Removed wording advising if NTD is unable to be installed, install to first socket. • General update of whole document – Template, material numbers, obsolete equipment etc.