



**Specification PTC 103: 2003**

**Telecom Code of Practice**

**For Residential-Type**

**Customer Premises Wiring**

**DRAFT FOR PUBLIC COMMENT**

Access Standards  
Telecom Corporation of New Zealand Limited  
Wellington  
New Zealand

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## RELATED DOCUMENTS

PTC 100	Telecom Permit to Connect: General Conditions
PTC 105	Telecom Code of Practice for the Cabling of Commercial Premises*
PTC 113	Code of Practice for ISDN Cabling and Wiring
PTC 222	Requirements for Customer Premises Cable
PTC 223	Requirements for 2-wire Jackpoints
PTC 225	Requirements for Star Wiring Boxes and Small Office Home Office (SOHO) Cabling Systems
Electricity Regulations 1997	
AS/NZS 3000	Electrical Installations, Buildings, Structures and Premises
BS 6312	Specification for Plugs to be used with British Telecom Line Jack Units
AS/NZS 3080	Telecommunications installations – Generic cabling for commercial premises
AS/NZS 3086	Telecommunications installations - Integrated telecommunications cabling systems for small office/home office premises

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## FOREWORD

This Code of Practice is intended for use by professional installers involved in providing residential-type telecommunications wiring for both residential and business premises. The primary aim of the code is to set methods and standards which will result in good performance and reliable service for customers. It covers the requirements for wiring connected to Telecom's network and provides information on related issues and practices.

Ownership of premises telecommunications wiring passed to residential customers following the enactment of the Telecommunications Act 1987. Consequently, those customers now have responsibility for the maintenance, repair and modification of wiring and any additional wiring installation. This responsibility may be assumed by any party nominated by the customer.

Telecom's "Standard Terms for Residential Customers" requires all sockets and wiring which connect equipment to the Telecom network, to meet and be installed to our (Telecom's) specifications". Compliance with this Code meets that obligation.

Up until 1983 telephones were generally permanently connected to the Telecom owned customer premises wiring. In 1983 a jack point 3-wiring system was introduced employing a 3-pair cable. This 3-wire system was the basis of the 1987 edition of this Code of Practice. This and earlier wiring arrangements are now regarded as "legacy wiring systems". The development of Telecom's standard "2-wiring" system in 1996 led to the use of 2-pair cable for most new installations and additional lines. The 1998 edition of this code covered the 2-wiring system, and specified acceptable means of extending existing installations.

This 2003 edition is a general up-date, which places more emphasis on simple "star wiring" or the more complex Small Office/Home Office wiring systems (SOHO). Both use star-wired Cat 5 4-pair cable as a recommended means of providing for likely future service needs. Residential customers may choose to install whichever option best fits their needs.

The focus is on residential type installations, but this code also applies to such wiring systems where they are used for business and commercial purposes.

Most wiring being installed now can be expected to be in use for at least 10 years; some a lot longer. Once installed, wiring is usually inaccessible and expensive to replace or augment. It is therefore in the customer's best interests to ensure that likely future requirements are considered when new buildings are to be cabled.

The installation practices recommended in this code of practice can be expected to achieve maximum long-term reliability.

## TELECOM DISCLAIMER

While every care has been taken, Telecom nevertheless makes no representation or warranty, express or implied, with respect to the sufficiency or utility of the information contained in this Code of Practice.

This Code sets out general principles for carrying out premises wiring and explains Telecom's standard practices. It is obviously not practicable to cover every situation that may arise in the large number of existing installations that have been carried out in New Zealand over many years. In view of this, Telecom expressly advises that the use of or reliance on the information contained in this Code of Practice must take into account the existing conditions at any particular premises.

Telecom shall not be liable for any loss (including consequential loss) damage or injury incurred by any person or organisation arising out of the sufficiency, accuracy, or utility of any such information or opinion.



# 1. GENERAL

## 1.1 Scope

### 1.1.1 Application

(1) This Code of Practice is primarily concerned with the installation of residential customer premises telecommunications wiring intended for connection to the Telecom network. The principles contained in the code also apply where the same wiring systems are used by business customers.

(2) Wiring systems for new residential-type installations covered by this Code are Telecom's standard 2-wire system (in both "loop" and "star-wired" modes), SOHO systems and various combinations of these.

(3) Small Office/Home Office wiring (SOHO) is based on AS/NZ 3086:1996 "Telecommunications installations – Integrated telecommunications cabling systems for small office/home office premises". This uses the RJ 45 jackpoint in place of Telecom's standard 2-wire version of the British Telecom 6-way jackpoint.

(4) Acceptable methods of extending and/or modernising existing older fixed wired and 3-wire installations are also included.

### 1.1.2 Intended Audience

(1) This Code of Practice is intended primarily for use by tradespersons and those carrying out telecommunications wiring on a commercial basis. Cabling hardware suppliers will find this code helpful when preparing installation instructions for their hardware products.

(2) Competency in electrical and telecommunications wiring techniques and practices has been assumed. Accordingly, emphasis is placed on the installation requirements of the hardware concerned and the need for service reliability under the wide range of New Zealand environmental conditions.

(3) Persons working on wiring provided solely for telecommunications purposes and working at Telecom Network Voltages are exempted from registration under the New Zealand Electricity Regulations 1997. However, the safety requirements of the Electricity Regulations, NZS 3000 and Telecom Codes of Practice must still be fully complied with.

(4) Some Telecom customers who wish to do work within their own premises, and who have an adequate knowledge of electrical and telecommunication terms and practices, will find the Code useful. For others, the simplified instruction sheets supplied with line hardware installation kits will be a satisfactory alternative where the work is simple and straight forward.

(5) Telecom recommends the use of experienced professional installers where there is any doubt about what is needed to comply with this Code of Practice.

### **1.1.3 Limitations on Customer Premises Wiring Work**

(1) Only customer-owned telecommunications wiring may be worked on. The Telecom cable lead-in from the street and the External Terminating Point (ETP) or network termination, where fitted, are specifically excluded.

(2) Any customer-owned wiring serving two or more Telecom customers shall be worked on by other than Telecom-authorised contractors only with the specific approval of all the customers concerned.

### **1.1.4 Benefits of Compliance**

(1) Compliance with this Code of Practice will ensure that the installation is acceptable for connection to the Telecom network.

(2) Compliance with this Code and use of the standard BT jackpoints will ensure eligibility for subscription to Telecom's optional residential standard wiring maintenance service. However, this wiring maintenance service does not cover:-

- (a) Cable cross-connection hardware used in Star-wiring boxes, SOHO cabinets or similar cross-connection facilities, or
- (b) RJ 45 type and related North American modular jackpoints and the cables used to connect them.

(3) Compliance with this Code will contribute to reliable long term performance of telephone and fax/data voice band services, ADSL services, etc.

### **1.1.5 Non-complying Installations**

(1) Non-complying new installations may require remedial work to be undertaken at customer expense before being connected to the Telecom network. Likewise, non-complying modifications to existing installations may subsequently incur costs to the customer if unsatisfactory service results.

(2) This Code of Practice need not be applied retrospectively. Any existing non-complying wiring may remain connected to the Telecom network provided that it does no harm to the Telecom network, and does not result in unsatisfactory connections for either the customer concerned or for other parties attempting to communicate with the customer.

### **1.1.6 Mode of Presentation**

(1) Use of the word "shall" in this document identifies mandatory requirements for compliance with this code, "should" refers to practices, which are advised, or recommended, "may" refers to matters which are optional.

(2) Mandatory requirements are highlighted for easy reference, as indicated in this clause.

(3) Clauses which are a formal part of this Code of Practice are numbered.

(4) Those which are added as explanations or background comments are printed in italics and with smaller text. For example:

- *RJ 45 jackpoints, star boxes, SOHO cabinets and their associated hardware are not covered by Telecom's wiring maintenance service.*

## **1.2 Telecom Network Demarcation Point**

### **1.2.1 Network Demarcation Point**

(1) The Network Demarcation Point forms the dividing line between Telecom's ownership of the network and a customer's ownership of the premises wiring. For most residential installations, this is the ETP, which is mounted on the outer wall of the building. In some situations, such as apartment blocks, the demarcation point may be the Telecom Network Termination (TNT). Under current Telecom practices, the internal building cable connects to the Telecom lead-in cable within the ETP.

(2) Where no ETP is fitted, the demarcation point is the point at which the cable enters the outer wall of the individual home or premises.

(3) Even though the lead-in cable from the network reticulation in the street may be run on private land, the lead-in cable and its associated pipe remain in Telecom's ownership. Where a customer changes to another network provider, that provider will install their own lead-in cable and generally connect to the premises wiring at the ETP. Where no ETP is fitted, the new provider will either install its own ETP or connect to the customer's wiring at the star point in a star-wired installation. For loop-wired installations, with no ETP or star point, the connection is made at an accessible jackpoint.

(4) Telecom is responsible for its ETP, lead-in pipe and lead-in cable and for any of its own network equipment installed within the customer's premises for the purpose of providing the customer with network services.

(5) Telecom will service all equipment, cable and pipe on its side of the network demarcation point and any Telecom-owned network equipment installed on the customer's side of the demarcation point as part of its network service. Telecom will also service any customer premises equipment rented from Telecom. Such servicing will not be subject to a charge where faults are caused by normal service conditions.

(6) The customer will own and be responsible for arranging all servicing of wiring and terminating or cross-connecting hardware within their premises.

(7) The customer may subscribe to Telecom's wiring maintenance service, in which case, Telecom will service only wiring and jackpoints covered by this service and installed in accordance with this Code of Practice.

- *BT jackpoints and associated cabling used for Telecom network services, independent of whether this cable is 2-pair, 3-pair or 4-pair, are covered by the Telecom wiring maintenance service. However, star point and SOHO hardware, RJ 45 and other North American-style jackpoints and the cable connected to these types of jackpoints are not covered by this service.*

(8) The customer may choose to carry out their own wiring installation and repairs, or call on any suitable contractor to carry out this work on their behalf.

### 1.2.2 Customer-Located Network Equipment and Service Delivery Points

(1) Although the Telecom network physically ends at the network demarcation point, there will be some situations that require Telecom-owned network equipment to be installed within the customer's premises to support network services. Whether or not such equipment is connected via customer-owned wiring, the customer's side of this equipment is termed a "Service Delivery Point".

(2) For non-voiceband based telecommunications services, Telecom will define the type of network equipment and its location (service delivery point) according to the particular application. In most cases, such equipment is supplied, installed and commissioned by Telecom as an inherent part of providing the service concerned.

## 1.3 Contracts and Obligations

### 1.3.1 Installer's Obligations

(1) In order to meet their obligations to their customers, installers need to be aware of several legal issues resulting from New Zealand consumer protection legislation, the Telecommunications Act, and contractual obligations between Telecom and its customers. The following outlines these issues.

(2) It is the responsibility of the installer to ensure that wiring is carried out in accordance the Electricity Regulations 1997 (or superseding regulations) and with all other relevant legal requirements. These may vary according to the particular conditions that apply in the premises in which the wiring work is to be carried out. Telecommunications wiring is NOT subject to routine inspection or the provision of Certificates of Compliance.

(3) The installer shall check for hazardous voltages before carrying out any work on premises wiring.

- *Hazardous voltages are not applied by Telecom to its lines, but nevertheless these are present on adjacent wiring and may sometimes be present on Telecom lines due to power distribution system faults, lightning activity, or other fault conditions.*

(4) Premises wiring carried out on a commercial basis on behalf of residential customers is subject to the terms of the Consumer Guarantees Act, 1993. This requires that the materials supplied and the manner in which the work is carried out shall be fit for its intended purpose. If wiring is not acceptable to Telecom, it is clearly not fit for the purpose of connecting to the Telecom network.

(5) Those persons involved in carrying out premises telecommunications wiring for commercial customers are required to comply with the Fair Trading Act 1986.

(6) Installers shall clearly advise the customer where they do any work or use any materials that are not covered by any wiring maintenance contract that the customer may have with Telecom. Otherwise the customer is likely to face unexpected charges.

- *For example, RJ 45 jackpoints, star boxes, SOHO cabinets and their associated hardware are not covered by this service.*

(7) Every situation that may be encountered in practice cannot be dealt with in detail in a document such as this. It is the installer's responsibility to see that all work is carried out in accordance with this Code and with any other special conditions which may apply.

### 1.3.2 Customer's Responsibilities

(1) Compliance with this code by customers, or by installers engaged by customers to install wiring, will enable customers to meet their legal obligations in receiving service from the Telecom network.

(2) Where service problems are found to be due to premises wiring of a poor standard or the failure of hardware not covered by this service, it will be the customer's responsibility to pay for the service call and for any repairs if called on to do so by Telecom.

(3) Where service problems are found to be due to the removal of hardware or customer premises equipment series-connected into the fixed wiring, such as alarm systems, ringing decoders, etc, a charge may be made for any remedial action undertaken by Telecom at the customer's request.

### 1.3.3 Cables, Jackpoints and Hardware

(1) All cables, jackpoints and hardware used in wiring a residential customer's premises and intended for connection to the Telecom network shall be Telepermitted unless Telecom has granted and published a specific relaxation of this requirement.

- *Examples of such a relaxation are Cat 5 or higher performing 4-pair cable, the sheath of which is marked with an industry-recognised certification and RJ 45 jackpoints.*

(2) All CPE or other equipment connected to residential customer premises wiring shall be Telepermitted or have a Telecom or NZPO label on it.

- *Pre-1988, all telephones were supplied by NZPO or Telecom and marked accordingly. While such items do not have Telepermit labels, they may be lawfully connected to the Telecom network.*

### 1.3.4 Telecom Exclusions from Liability

(1) Telecom accepts no liability where it is found necessary to disconnect any non-Telecom services or equipment making use of the same premises wiring, should such services or equipment have led directly or indirectly to the disruption of Telecom services.

(2) Telecom accepts no liability for damage caused to customer equipment by over voltage which may occur on Telecom lines due to fault conditions, lightning or for any other reason.

## 1.4 Definitions

**Accessory:** any device, not itself directly providing a telecommunications function, which is plug connected to the premises wiring.

**BT jackpoint:** any jackpoint which mates with a plug to BS 6312.

**Customer-located network equipment (CLNE):** Telecom-owned network terminating equipment required to provide a specific Telecom service and located within the customer's premises on the customer's side of the network demarcation point

**Customer premises equipment (CPE):** any telecommunications terminal equipment connected to the customer's wiring, other than CLNE.

**Daisy-chain (or loop) wiring:** a common form of wiring where a cable to one jackpoint is connected to another cable to the next jackpoint.

**Demarcation point (or network demarcation point):** the point at which the Telecom lead-in cable enters the customer's building and, usually, also the point at which the customer's wiring is connected to the network lead-in cable.

**Extension jackpoints:** see "Secondary"

**External cable:** cable intended for installation outside buildings, exposed to the weather or ground contact, and provided with an appropriate protective sheath.

**External Terminating Point (ETP):** an external box, in which the lead-in cable is connected to the internal building wiring. Also (incorrectly) known as External Test Point. The demarcation point, when provided.

**Hardware (or line hardware):** any fixed wired device other than CPE.

**IDC:** Insulation Displacement Connector, commonly used to terminate wiring at hardware.

**Inside cable:** telecommunications cable intended only for use within a building.

**Jackpoint:** any type of outlet used for plug-connecting CPE.

**Lead-in cable:** the Telecom owned cable used from the street to the customer's premises.

**Legacy wiring systems:** a general term to describe all earlier wiring systems which preceded Telecom's current 2-wire standard.

**Line grabbing:** a function of series CPE which disconnects other wiring and CPE from the line to either terminate or initiate a call.

**Master jackpoint:** the earlier standard 3-wire jackpoint incorporating the electrical components for the conversion of the line to three-wire operation within the premises.

**May:** refers to matters which are optional.

**Pair:** any set of two wires, which are usually twisted in a cable, used to provide a circuit.



**Residential-type:** a general term to describe wiring systems used mainly in residential customers' premises, but also commonly used for small business applications where structured or generic cabling has not been warranted.

**RJ 45:** the 8-way modular jackpoint originally used in North America and now standardised internationally.

**Secondary jackpoint:** the earlier standard 3-wire jackpoint used in conjunction with a master jackpoint. Also called an "extension" or "slave" jackpoint.

**Series CPE:** any CPE connected in the path between other CPE and the network.

**Shall:** identifies mandatory requirements for compliance.

**Should:** refers to practices which are recommended.

**Socket:** another name for "jackpoint" or "telecommunications outlet".

**SOHO (Small Office/Home Office) cabling:** an optional cabling standard, typically used for those installations requiring additional flexibility for voice and data services, and currently standardised in AS/NZS 3086.

**Star wiring:** an arrangement whereby each jackpoint is separately cabled to a central point, where cross-connect facilities may be provided.

**Structured cabling (often referred to as "Generic" cabling):** multi-purpose high performance cabling systems installed to AS/NZS 3080 or equivalent standards.

**Tee connection:** a third connection also made at a daisy-chain point.

**Telecommunications Outlet (TO):** the international term to describe any type of socket or jackpoint into which terminal equipment may be connected.

**Telepermitted:** CPE, hardware or cable marked with a Telecom "Telepermit" label to indicate that it complies with Telecom specifications.

**Test termination:** a sealed resistor/capacitor combination, usually fitted within an ETP to provide a remote line test capability independent of whether any CPE is connected to that line.

**Three-wire (3-wire):** the legacy system of BT jackpoint wiring, whereby a Master jackpoint incorporates a shared capacitor to derive a third wire for ringing to all jackpoints.

**Two-wire (2-wire):** the present standard BT jackpoint system where one pair interconnects all 2-wire jackpoints, each of which incorporates a capacitor to ring older 3-wire connected CPE.

**Voiceband:** frequencies up to 4 000 Hz and, in particular, the nominal frequency range 300 Hz – 3400 Hz used for voice transmission

**Wiring (premises wiring):** all cable and directly connected hardware on the customer's side of the demarcation point.

## 1.5 Overview of Acceptable Wiring Options

### 1.5.1 Installation Options Acceptable to Telecom

Options acceptable to Telecom for new installations, and extensions to existing installations are indicated in Table 1 below, together with a reference to the relevant section of this code:

TABLE 1

Type of Residential Installation Work	Acceptable Options	Code of Practice Reference
New installations	Either: Standard 2-wire system 1 <sup>st</sup> preference: Star wiring with 4-pair cable 2 <sup>nd</sup> preference: Loop wiring with 2-pair cable	Section 3
	Or: Small Office/Home Office wiring (SOHO) systems conforming to AS/NZ 3086: 1996	Section 4
Extensions to installations with fixed wired telephones, non-Telepermitted hardware, or older bell types.	Convert to standard 2-wire system	Section 5.5
Extension to 3-wire installations with one master jackpoint.	1 <sup>st</sup> preference: Convert to standard 2-wire system	Section 5.5
	2 <sup>nd</sup> preference: Extend with 2-wire sockets, but only in the manner prescribed	Section 5.4
Extension to 3-wire installations with two or more master jackpoints.	Convert to standard 2-wire system	Section 5.5
CPE needing more than two wires: 4 wire data circuits, ISDN S/T bus distribution, etc.	Small Office/Home Office (SOHO) wiring system.	Section 4



### 1.5.2 2-wire Standard

(1) Telecom's current wiring standard is termed "2-wire" and is used for new wiring for basic services as detailed in Section 3 of this Code of Practice. Other wiring systems are described below.

(2) Where there are few jackpoints to be installed, 2-wire installations may still be daisy-chained with 2-pair cable. However, in view of its improved flexibility for future services, star wiring with 4-pair cable and 2-wire jackpoints is now recommended as the low cost option for all new installations and major re-wiring projects, even where only a few jackpoints are needed.

### 1.5.3 SOHO Standard

An alternative wiring standard providing improved flexibility is SOHO. This is also star wired, but provides access to all pairs of a 4-pair cable by using RJ 45 jackpoints. It is required for connection of CPE needing more than one pair – eg, ISDN, LAN terminals, multi-line and/or intercommunicating telephones, as well as supporting basic telephone service.

- *SOHO wiring is prescribed in AS/NZS 3086 and Section 4 of this Code of Practice.*

### 1.5.4 3-wire Standard

(1) This was Telecom's wiring standard which preceded 2-wire. Now obsolescent, this system used a master jackpoint (designated M) and a number of secondary jackpoints (designated S or E) interconnected by 3 wires. Non-standard variants include fixed wired telephones and multiple master jackpoints. Shortcomings causing noise, ringing and reliability deficiencies are overcome in the 2-wire standard.

(2) 3-wiring shall NOT be used for new installations or extensions.

- *Telepermits have been cancelled for the earlier 3-wire Master jackpoints, which are generally no longer available.*

### 1.5.5 Fixed wired CPE

Prior to the introduction of BT jackpoints, CPE was either wired directly to the fixed wiring or connected by early types of jackpoints. All variants are obsolete.

## 2. REQUIREMENTS FOR ALL WIRING SYSTEMS

### 2.1 Safety Requirements

#### 2.1.1 General

Every care shall be taken that work is undertaken safely, especially where changes to existing installations involve work in dark ceilings or access into wall cavities often containing power cables and possibly gas pipes. Potential hazards shall be identified and located prior to starting each aspect of the work. Compliance with all relevant safety standards is required.

### 2.1.2 Hazardous Voltages

(1) Under normal conditions no hazardous voltages are applied by Telecom to any of its lines. Nevertheless, it is possible for lines to become hazardous at any time from earth potential rise, power distribution system faults, lightning activity, or contact with power wiring within the customer's own premises or equipment.

(2) Safe electrical industry working practices shall be followed. These include completion of all wiring connections before finally connecting to the line.

- *It is not normally necessary to touch bare conductors during installation and connection because of the extensive use of insulation displacement connectors (IDCs).*
- *This practice will also minimise the risk of shock from non-hazardous network voltages such as ringing, causing possible injury from the personal reaction to a shock, such as losing balance and falling.*

## 2.2 Lead-ins and Entry Points for New Installations

### 2.2.1 Lead-in cable

(1) Telecom will provide the lead-in cable and its readily identifiable "green pipe" as part of its network service and will continue to own these components.

(2) In most cases, the network cable terminal is located on alternate section boundaries at the road frontage and the lead-in is run across the customer's land to the ETP. In the case of back-sections without a public road frontage, it may be necessary for the lead-in to pass over or under land owned by parties other than the customer concerned. In such cases, those parties will be required to formally agree to such crossings before Telecom can do the installation work.

- *This will usually require a formal easement to be written into land records, such that a subsequent owner of the land cannot demand that the cable is removed.*

(3) Lead-in cable or pipe can share a common trench with other services, subject to adequate protection against hazards or damage.

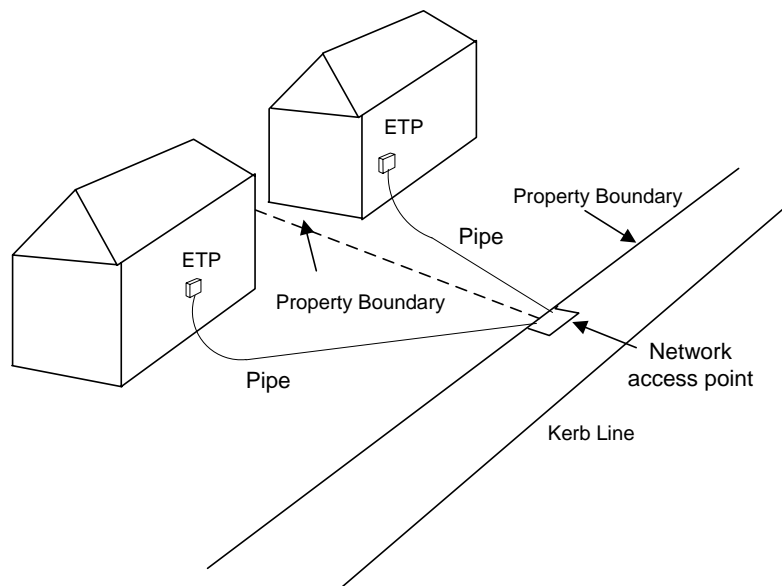
- *For further information on urban lead-in provisioning see <http://www.telepermit.co.nz/Urban.pdf> for urban installations or <http://www.telepermit.co.nz/Rural.pdf> for rural installations.*

### 2.2.2 Entry Point for Residential and Small Business Premises

(1) If not already provided, Telecom will arrange installation of an individual lead-in cable and ETP, or a distribution point for premises requiring a larger number of connections. For residential buildings where each unit has a street frontage, the ETP location will generally be on the wall facing the street, with clear access to the cable terminal on the road frontage. The ETP will be positioned a minimum of 300mm above finished ground level for underground lead-ins and on a gable end or fascia board for overhead lead-ins.

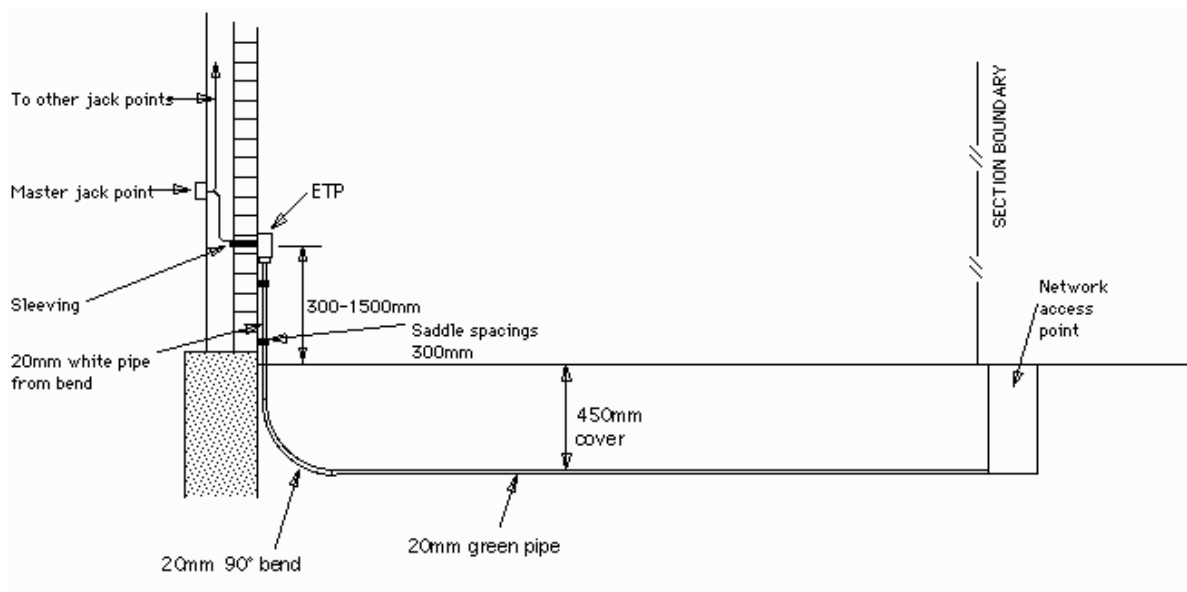
(2) For new premises, a suitable entry point location for connection of the customer's wiring should be selected. The general location is normally arranged with the developer for new sub-divisions, and is usually obvious from adjacent properties in developed areas.

In cases of doubt, Telecom will provide guidance on receipt of advance application for service from the customer.



### 2.2.3 Connection of Wiring to the Lead-in Cable

Independent of the number of jackpoints and cables installed, a single cable shall be extended from inside the premises to the location of the ETP. A 1 m tail shall be left at this point. This cable will be connected to the lead-in cable by a Telecom contractor.



## 2.3 Premises Wiring

### 2.3.1 General Wiring Issues

(1) The following wiring practices and requirements apply specifically to residential wiring, though the same principles also apply to many small business applications.

(2) Particular attention shall be given to the prevention and control of water entering cables through or along their sheaths, which is the dominant cause of wiring faults in typical New Zealand dwellings.

(3) This problem is likely to be more serious with SOHO installations because of the closer pin spacing and the unprotected design of some jackpoints used, especially where high frequencies are used for enhanced applications.

### 2.3.2 Acceptable Cable Types

(1) For new inside installations, the cable used shall be either 2-pair cable Telepermitted in the PTC 222-series, or 4-pair cable bearing an industry-recognised certification mark. Other than for the exceptions in (2) and (3) below, all new cable shall have 0.5 mm conductors.

- *More specific detail is provided in later sections.*

(2) New cable terminated on an existing 3-wire jackpoint, which is not being converted to 2-wire, shall have the same gauge conductors as that of the existing cable.

- *See sections 5.3 and 5.4. Conversion of the existing jackpoint to 2-wire is recommended.*

(3) Cable used for wiring outdoors shall be purpose made 2-pair “external telephone cable.”

- *These cables are grease filled and have solid (not stranded) 0.63 mm diameter conductors. “Buried” and “self supporting aerial” types are available. Pair 1 is usually blue and blue-white and pair 2 orange and orange-white. Alternatively pair 1 may be yellow/black and pair 2 is brown/white.*

(4) “External” telephone cable shall not be terminated on 3-wire jackpoints or wherever more than one conductor is terminated in a single IDC slot.

- *See section 2.3.8 and 2.3.9 for applications.*

### 2.3.3 Segregation of Services

(1) Telecommunications cables shall be installed with a permanent separation of at least 50 mm from mains power cables in all locations, except where the cables are separately enclosed.

(2) Jackpoints and associated hardware shall not be fitted closer than a horizontal distance of 200 mm from any fitting on which mains voltage cables are terminated, unless separated by a rigidly fixed barrier.

(3) Complying barriers include wall linings, full depth framing in walls and substantially enclosed boxes. Electrical flush mounting brackets and open type flush boxes are NOT substantially enclosed in the above context. Without a barrier, the minimum 200 mm horizontal separation applies to both sides of a wall unless the wall cavity exceeds 200 mm depth.

(4) To minimise the risk of noise by induction, telecommunications cable should not be run closely spaced and parallel to wiring of other services. Where it is not practicable to

completely avoid such parallel runs, any length where spacing is close to the minimum of 50 mm, shall not exceed 3 m.

(5) To avoid the risk of electrical hazard and noise caused by induction, wiring connected to the Telecom network shall only have Telepermitted equipment and hardware connected to it. Should there be a need for connection of any other local equipment such as bells, intercom, alarms, etc, separate cables and terminating hardware shall be used.

### **2.3.4 Wiring under Floors**

(1) Cable shall be run clear of potentially wet surfaces, such as the ground, along areas at the bottom of outside walls, bathrooms, showers, water tanks, laundries, and any other areas where unintended water leakage or dampness may occur.

(2) Joints in and connections to cables shall be made only in readily accessible locations and using purpose-designed terminating hardware.

- See clause 2.3.10

(3) The cable shall be clipped or stapled at changes of direction and at intervals sufficient to prevent undue sag and potential contact with subsequent groundwork or snagging during other under-floor operations.

- Closely spaced clipping along timber should be avoided, unless this is necessary for appearance purposes when the cable is exposed to regular view.

### **2.3.5 Wiring above Ceilings and in Walls**

(1) Cables in ceilings and wall cavities shall be segregated from power cables in accordance with clause 2.3.3.

(2) Cables in ceilings shall be routed clear of areas where potential damage may occur, such as areas used for storage, or around chimneys, flues, heating ducts, water tanks and plumbing.

- Cables should be routed along timber above the ceiling joists wherever possible, to avoid exposure to any water retained by the thermal insulation used between the joists.

- Cables above cathedral ceilings and horizontal runs in outside wall cavities should be avoided wherever it is practicable to do so.

(3) In any roof areas where the height exceeds 600 mm, cable shall be laid below or clear of surfaces likely to be stood or knelt on, and shall be clipped or stapled to prevent snagging during later operations.

(4) Cables shall not be clipped in wall cavities or other inaccessible areas.

(5) Joints in and connections to cables shall be made only in readily accessible locations and using purpose-designed terminating hardware.

- See clause 2.3.10

### 2.3.6 Wiring Within or Beside Concrete Structures

- (1) Cables shall not be laid direct into concrete walls, floors or ceilings. Where it is necessary for cabling to pass through or be carried within a concrete structure, it shall be housed within a rigid plastic pipe. The installation shall facilitate later removal and replacement of the cables, if required.
- (2) Internal building cable shall not make direct contact with concrete surfaces, particularly of outside walls and ground retaining walls. Where exposed surface wiring cannot be avoided, separation from the concrete shall be provided by enclosure in conduit or trunking, or by clipping to a timber batten.

### 2.3.7 Surface Wiring

- (1) Surface wiring shall be avoided in areas subject to potential damage, including within 50 mm of floors. Wherever possible, surface cables shall be protected from inadvertent physical damage by running them along the edges of skirting boards, scotias, architraves, or window and door frames.
- (2) Cables shall be clipped or stapled at changes of direction and also at intervals not exceeding 300 mm in areas where they may be disturbed. This includes the interiors of cupboards, wardrobes, and the like.

### 2.3.8 Wiring Between Buildings on Same Site

- (1) Where the cable can be run entirely within a fully enclosed access-way, it is deemed to be inside wiring.
- (2) Inside cable may be run in conduit only where the cable run is relatively short, above ground, sheltered from weather, and the conduit can be supported over the full distance on a convenient surface. Such installation shall provide for later removal and replacement of the cable, if required.
- (3) External cable, as specified in clause 2.3.2(3), shall be used in above-ground locations exposed to weather, and shall be attached to a structural surface or adequately supported by a self contained or separate bearer wire. The route shall be clear of potential hazards and potential damage. Any poles used shall adequately support a ladder to facilitate maintenance.
- (4) To facilitate later removal and replacement of the cable, if required, external cable used for underground runs shall be installed in a buried pipe which extends at least 300 mm above the floor within an indoor location at each end.

### 2.3.9 Wiring to Equipment Exposed to the Weather

- (1) Where equipment and its associated cabling and wiring are exposed to the weather, all such components shall be of a design suitable for this purpose.
- (2) Standard jackpoints shall not be located outdoors.
  - *The need for external jackpoints has, in any case, been superseded by cordless telephones.*
  - *Cable for outdoor use is specified in clause 2.3.2 above.*

### 2.3.10 Wiring Connection Practices

(1) New cables shall be jointed together using only Telepermitted jackpoints or other Telepermitted terminating hardware at readily accessible indoor locations.

- *This excludes enclosed areas used for other purposes, such as in wardrobes and cupboards. This also excludes under-floor and ceiling spaces, except where walk-in access is provided to areas developed for occupation.*

(2) Cables shall enter terminating hardware enclosures only from below in order to prevent water transported on or within the sheath from reaching the terminals or associated insulation and conductors.

- *For surface mounting boxes, this requires cable entry at a bottom corner of the rear. For flush mounting boxes, cable entry needs to be from the bottom.*

(3) The ends of cable sheaths and any unterminated wires shall be confined below and clear of the termination assembly and jackpoint circuit board.

(4) To comply with safety requirements relating to segregation from power cables, all unsheathed wires shall be accommodated within the box.

- *Especially where 4-pair cables have been used and plenty of surplus cable is retained, it is recommended that the surplus conductors be cut off to avoid any risk that they may cause unintended contact with other wires or components.*

(5) At least 500 mm of cable shall be left slack in the wall cavity at both ends of a run.

- *For new installations, the cable from the ETP should provide at least 1 m of slack at the first terminating point, to provide for connection of future equipment.*

(6) Only wires of conductor diameter of 0.4 mm to 0.65 mm shall be terminated in IDC slots. Other than for 3-wire jackpoints, only one such wire shall be terminated in each slot.

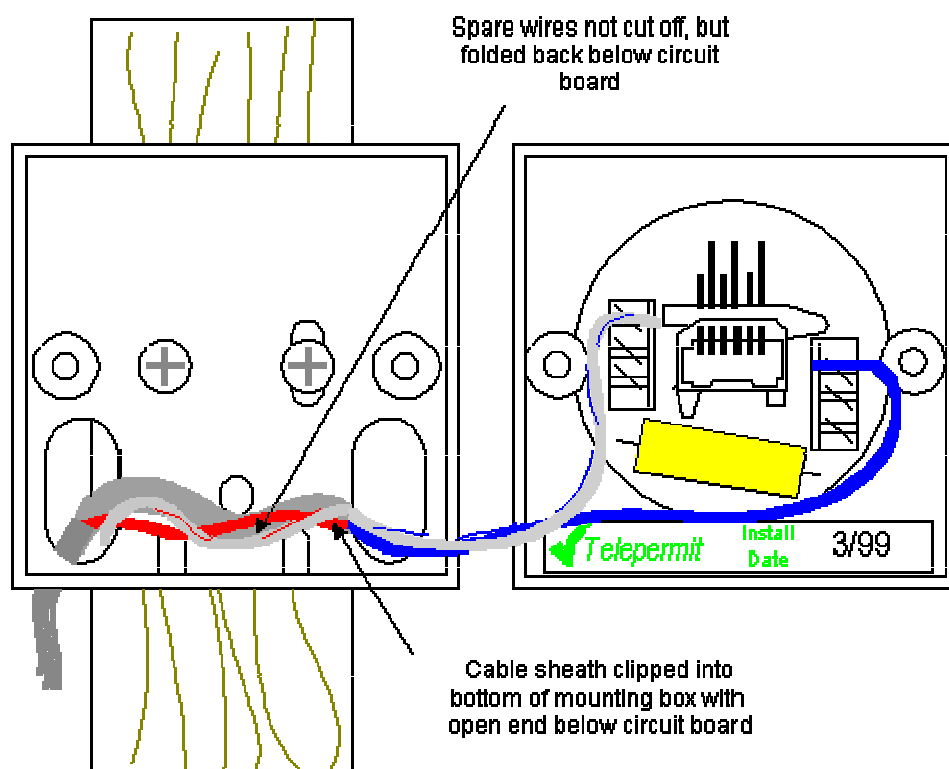
(7) For 3-wire jackpoints, where two wires need to be terminated per slot, both conductors shall be of the same diameter.

## 2.4 Jackpoints

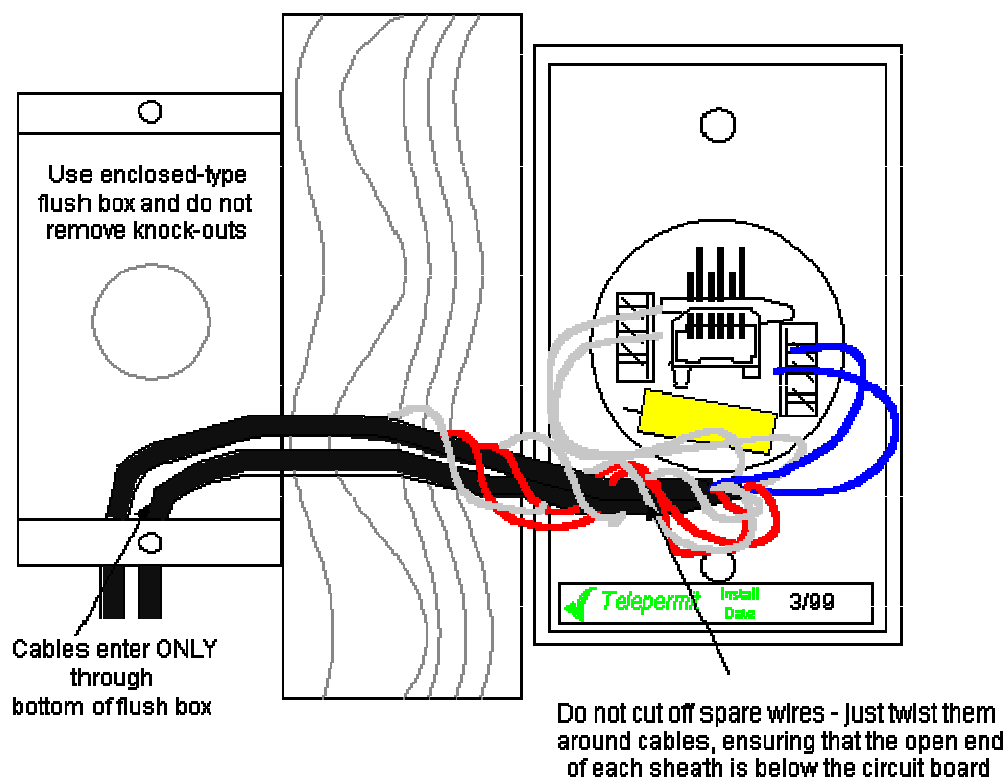
### 2.4.1 Provision of Jackpoints

(1) The total number of jackpoints that may be installed in any premises is not restricted. However, the total CPE items which will operate correctly on a single analogue line is limited by the sum of the ringing numbers (RN) assigned to each CPE item connected to that line. For reliable ringing detection, the total of the individual CPE "RN" numbers should not exceed 5.

(2) Fixed wiring of CPE is limited to those devices, such as security and medical alarms, whose primary purpose would be defeated, if plug connected. Line grabbing CPE, such as security diallers, may be directly connected, but using only Telepermitted hardware in accordance with this Code.



**Standard Surface Mounted 2-wire Jackpoint**  
(wallboard omitted to show stud fixing)



**Flush Mounted Powermatch 2-wire Jackpoint**  
(wallboard omitted to show flush box and mounting)



### 2.4.2 Restricted Locations

(1) Jackpoints or other termination hardware shall not be sited where they are subject to dampness or dirty conditions, to excessive heat, or where they are likely to be subjected to mechanical damage. This precludes location outside a building, in bathrooms, showers and laundries, as well as on obviously damp or insecure walls.

(2) Jackpoints or other termination hardware shall not be mounted less than 300 mm above the finished floor level.

### 2.4.3 Cleanliness

All line hardware is to be kept clean during installation, avoiding contact with dirty hands or other contamination likely to cause premature corrosion.

### 2.4.4 Mounting Hardware

(1) Boxes used for mounting jackpoints and other terminating hardware shall be of substantially enclosed construction. The sides, top and bottom of surface mounting types shall be continuous with provision for cable entry at the lower rear. The sides, rear and top of flush mounting types shall be continuous except for small holes, and the bottom shall contain a cable entry hole not exceeding 30 mm diameter.

(2) Jackpoint mountings shall be securely fixed in position. If not screwed to timber, they shall be rigidly fixed to wallboard using suitable fasteners.

### 2.4.5 Terminating Requirements

(1) Wires shall be terminated on line hardware only with the correct purpose-designed tool for the hardware concerned.

(2) For new work, the blue/blue-white pair is assigned to the first-in telephone line. The orange/orange-white pair is reserved for a second line.

(3) The pair of wires from each cable shall be terminated with one wire to each IDC assembly of a 2-wire jackpoint. The same corresponding slot on each side shall be used for each pair.

(4) The 3rd slot on each side should be preferably left vacant for future extensions. Where adequate surplus cable is not available for later use, second pairs should not be cut off but folded back for possible future use.

(5) All wires of any cable containing a pair connectable to a network service shall be used only by Telepermitted equipment, to avoid potential over-voltage, balance and noise issues.

(6) The wires of a pair shall be kept together and shall be untwisted to the minimum practicable extent consistent with sufficient length for terminating them.

(7) In addition to the mandatory requirements of clause 2.3.10, the following mandatory requirements apply to wiring terminations in insulation displacement connectors:-

- (a) Insulated wires shall be inserted into the slots with the insulation undamaged in the vicinity of the actual connection. They shall be inserted individually from the correct direction – ie, from the side opposite the housing shoulder for Krone type IDCs – before individually pushing each wire home.
- (b) No attempt shall be made to terminate wires of types other than those which are specified for telecommunications wiring.

(8) Each pair of a 2-pair cable may be connected to a separate jackpoint only at a dual outlet type. Otherwise, the second pair may be connected through to the second pair of other cables by means of connections made within the terminal boxes.

(9) All 2-wire jackpoints shall be marked by the installer with the month and year of installation.

## 2.5 Earthing

(1) There is no provision for an earth connection to CPE via standard jackpoints. CPE is deliberately isolated from earth as a safety measure.

(2) Safety is assured only for CPE bearing the appropriate Telepermit label. Specific earthing and isolation requirements apply to mains powered CPE and separate power supplies. Only Telepermitted equipment may be lawfully connected to the network.

(3) This code of practice does not specifically cover requirements for screened cabling, which is not necessary for current Telecom-supplied services. Where screened wiring systems are supplied commercially, the supplier shall provide clear information on the installation practices needed to ensure system integrity and performance.

- *Should future Telecom broadband services require screened cabling and jackpoints, the necessary earthing and installation practices, together with power requirements for the associated network equipment, will be addressed in a separate specification.*
- *Telecom's residential premises wiring maintenance service does NOT cover screened cabling or its associated components.*

### 2.5.1 Installation Testing

(1) Before handing any new or altered wiring installation work over to the customer, such work shall be thoroughly tested to ensure that all wiring is correctly terminated in accordance with the type of jackpoint and termination hardware used. Wiring capable of being connected to Telecom's network shall be free of short-circuits, contacts with other conductors, and discontinuities. Pair integrity shall be maintained. Any defective cables shall be replaced.

(2) Where problems arise, the installer shall ensure that all necessary remedial action is taken.

## 3 2-WIRE INSTALLATIONS

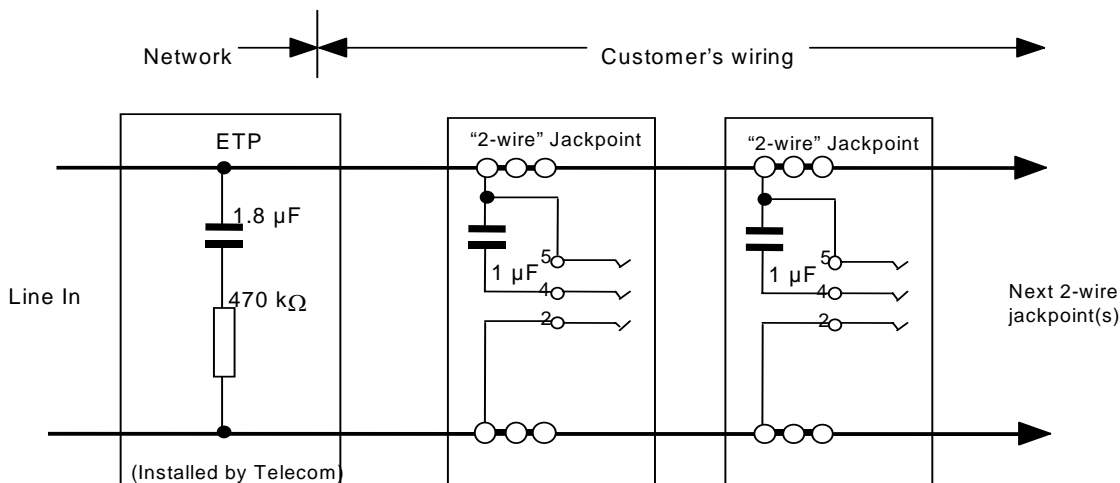
### 3.1 General

(1) 2-wire installations may be carried out in either “daisy-chain” (“loop”) or “star” mode. In both cases, all jackpoints for the voiceband services provided by the same telephone line are generally commoned together, either by the inter-connecting cables or by a suitable commoning facility in the star box.

(2) xDSL-based services, typically ADSL (Telecom’s “JetStream”), may share the same wiring, in which case line filters are required at each voiceband service jackpoint. Alternatively, a splitter can be provided by Telecom, along with a separate cable from the network termination to the jackpoint selected for the ADSL modem. In this case, the remainder of the premises wiring does not carry any high frequency signals.

- Where a splitter is fitted and a new jackpoint installed especially for connecting the ADSL modem, this jackpoint should be clearly marked “JetStream” or “ADSL”. This will help future occupants of the premises to avoid fitting line filters to this jackpoint or unnecessarily requesting Telecom to install a second splitter.

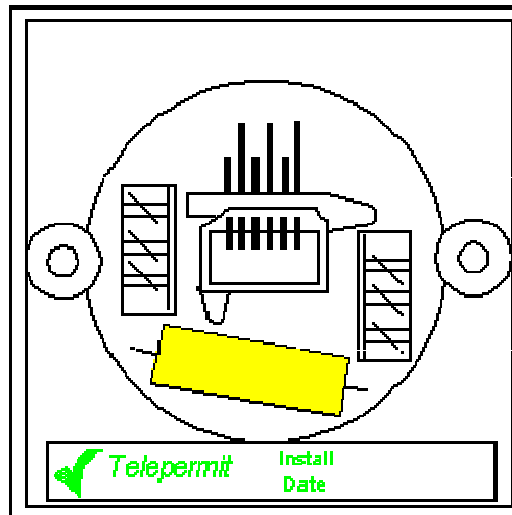
(3) The 2-wire system was developed by Telecom to overcome the shortcomings of reliability, transmission, and ringing impairments of the earlier standards and to provide for simplified installation and satisfactory performance of a greater number and variety of CPE connected to a line. It is the current Telecom standard for new installations.



**Schematic of Loop or Daisy-chain 2-wire system**

(4) Full conversion to 2-wire is strongly recommended when extending or altering existing 3-wiring installations.

(5) For identification, 2-wire jackpoints are marked with a "2", either on their faceplates or on their shutters.



**Rear of Telecom's standard 2-wire Jackpoint**

### 3.1.1 Loop (or Daisy-Chain) Wiring

(1) One pair of wires is used to directly interconnect jackpoints, as shown in the schematic diagram. Virtually all 2-wire jackpoints provide terminations for both daisy-chain and tee connections, thus providing for future extensions to be connected to any convenient existing jackpoint.

(2) 2-pair cable Telepermitted to PTC 222, shall be used for Loop wiring.

- *4-pair cable could be used, but its flexibility for future applications is restricted if it is connected in daisy-chain mode, as individual jackpoints are not easily separated from the common run for special applications.*

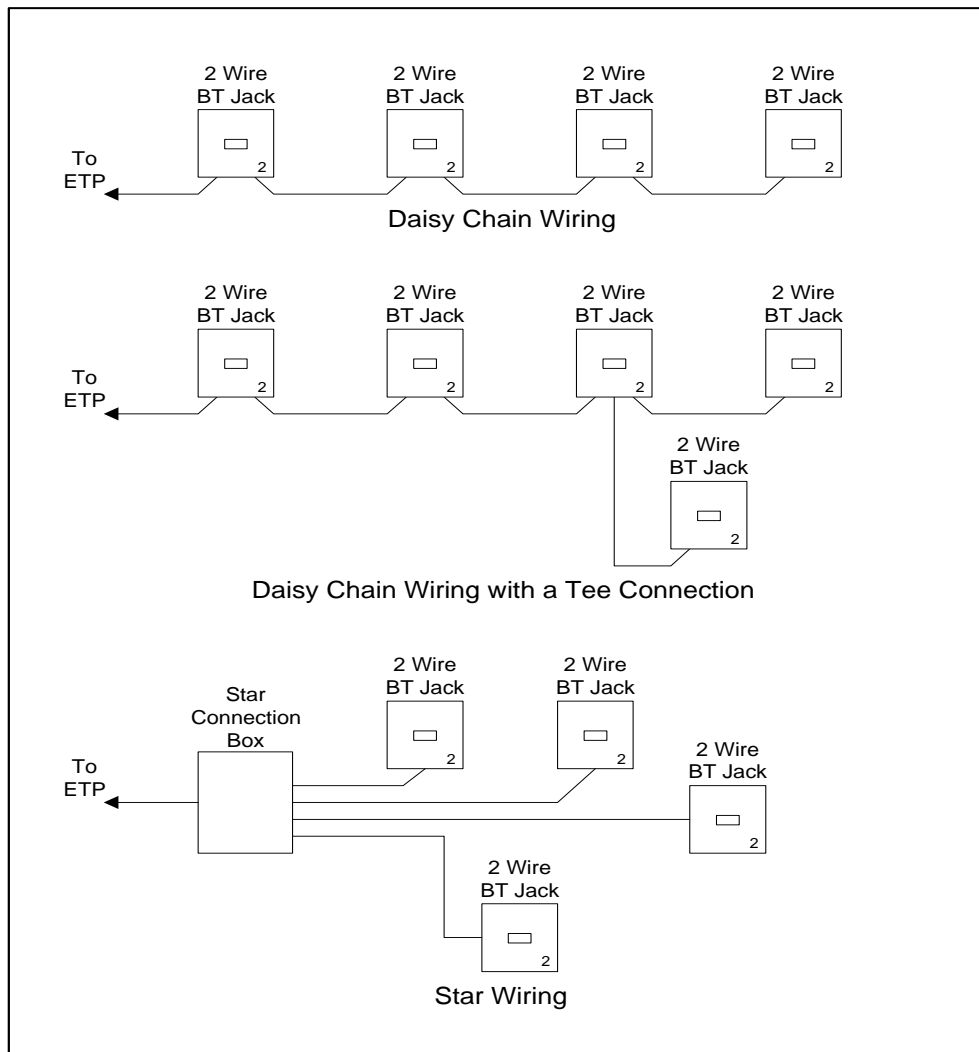
(3) The second pair is usually reserved as a spare in case of cable damage. However, it may be used for second line applications subject to the conditions of clause 2.4.5 (6)

(4) Only Telepermitted 2-wire jackpoints and Telepermitted hardware shall be used.

(5) Loop wiring is suitable for all voiceband services and for ADSL, subject to the correct use of line filters in all jackpoints other than the one to which the ADSL modem is connected.

- *A splitter is required where there are more than 5 voiceband jackpoints in use or where a monitored alarm system has been installed. Where a splitter is used in a loop-wired installation, a separate cable must be run from the splitter to the jackpoint selected for the ADSL modem.*

(6) Loop wiring shall comply with Section 2 of this Code of Practice.



**Schematic of Wiring Topology Types**

### 3.1.3 Star-wiring with 2-wire jackpoints

(1) Star wiring, using 4-pair cable of at least Category 5 performance rating, is now Telecom's recommended practice for all new installations and major extension or re-wiring work. This recommendation is based on the expected need for new wiring to support a wide range of future network and home services.

(2) Much of the wiring installed today, along with its 2-wire jackpoints, will continue to support voiceband services for many years. In view of this, and the fact that virtually all CPE uses the matching 6-way BT plug, the 2-wire jackpoint is still regarded as the most appropriate type of outlet for the majority of current applications.

(3) "Next Generation" telecommunications networks are expected to provide multiple services over the one telephone line, with each service being separated out within the customer's premises by Telecom-supplied network terminating equipment, termed "customer-located network equipment". Each separate service is then connected to one or more specific jackpoints. This is far more easily achieved if each jackpoint is separately cabled to a central location – the star point. This provides commoning facilities for today's

voiceband services and, possibly with additional hardware, permits the re-termination of any jackpoint cable from the commoning point onto a specific service termination.

- *Relative to daisy-chain wiring, star wiring involves somewhat more cable and requires suitable terminating hardware. As such, it will usually be more expensive to install than daisy-chain wiring.*
- *Nevertheless, most cable remains in service for many years, so it is preferable to install extra cable and jackpoints when opportunity arises and reduce the risk that additional cable will be needed in the future. Especially during new building work, it is recommended that jackpoints and cabling additional to immediate requirements be provided at all potential CPE locations while the framing is still accessible for cable runs. This includes providing jackpoints for possible LAN applications and a jackpoint by at least the main television set for digital TV programme control.*

(4) Other than for the use of certified and appropriately labelled 4-pair cable and the provision of additional termination hardware, wiring practices for star wiring shall comply with Section 2 of this Code of Practice.

(5) The 2-wire jackpoints and any star box or termination hardware used for star-wiring residential premises shall be Telepermitted.

(6) The Telepermitted connection box or hardware used to terminate wiring to the jackpoints concerned shall be located in a readily accessible position, preferably near the centre of the premises in order to avoid long cable runs.

(7) For new installations, a single 4-pair cable shall be run from the star box to the proposed ETP location, leaving at least 1 metre of cable for termination at the ETP.

## **3.2 Permissible Variants to 2-Wire systems**

### **3.2.1 Series-connected CPE**

(1) While it is preferred that all jackpoints are directly connected to the network to provide wiring integrity and enable initiation of possible emergency calls, it is acceptable for some or all jackpoints and their associated wiring to be controlled by CPE in series with the line.

(2) Where possible, associated CPE should be directly plugged into the series CPE that controls it, so that users are aware of the arrangement should they be unable to initiate or answer a call.

- *Typical examples are a ringing decoder or a caller display adjunct unit to which the associated CPE is connected. If a call cannot be made via the series device, it can easily be disconnected for test purposes.*

(3) When the function of series CPE depends upon its connection to fixed wiring, the connection shall be made at either a jackpoint or at the star wiring hardware on the network side of the jackpoints to be controlled.

- *Typical examples are security and medical alarms, which need to seize the line in an emergency, independent of whether the line is already in use for other purposes.*

- *An acceptable option is to use two jackpoints or a dual outlet type, with these wired to provide the "line" and "house" wiring connections.*

(4) In all cases where there is no ETP and a test termination has been installed in the wiring, the test termination shall be directly connected to the lead-in cable and always on the network side of any series CPE.

### **3.2.2 Other fixed wired CPE**

(1) Permanently connecting CPE to the fixed wiring is permissible, only where there is clear justification for doing so. All such connections shall be made at jackpoints or at other Telepermitted terminating hardware.

- *Typical examples are monitored security and medical alarm systems, which need to be permanently installed rather than plug-connected.*
- *Other examples are payphones, where an exposed and accessible jackpoint would obviously provide opportunity for unpaid calls, and weather proof CPE located outdoors, where the outdoor cable needs to be terminated on suitable terminals provided within the CPE.*

### **3.2.3 Star wiring with RJ 45 jackpoints**

(1) At least some star-wired 2-wire jackpoints installed initially for present-day voiceband network services are expected to be re-terminated at both the star box and at the jackpoint to meet future service requirements, leaving the remainder connected via a commoning strip to continue to support the existing services.

(2) The type of jackpoint required for future Telecom services has not yet been decided, although the RJ 45 is an obvious contender. The RJ 45 is currently used for ethernet LAN-based services and some telephone jackpoints are expected to be diverted to this purpose, especially where broadband services are used and it is necessary to connect two or more PC's to that service via an ADSL modem/router.

(3) Provided that a star box has sufficient space to mount the appropriate 4-pair cable hardware (and, preferably, the associated router), star wiring facilitates diversion of any jackpoint cable from a 2-wire commoning strip to a separate 4-pair termination in the Star box. The BT jackpoint on that cable is replaced by an RJ 45 for LAN applications.

(4) Installers shall advise their customers that all wiring and RJ 45 jackpoints on the customer's side of the jackpoint to which a router is connected are excluded from coverage under Telecom's current residential wiring maintenance service. This exclusion also applies to any dual outlet BT/RJ45 jackpoints that may be used.

### **3.2.4 Door and Gate entry control systems for individual customers**

(1) Special requirements apply to any systems which make use of the premises telephone wiring to carry entry authorisation or gate control signals.

- *Typically, such systems use a telephone, located at the gate or outside door, which directly rings the internal telephones. After ensuring that the caller is genuine, the occupant simply enters a code via the telephone keypad to unlock the gate or door.*

(2) All gate and door entry control system equipment intended to be connected to the Telecom network shall be Telepermitted and be labelled accordingly.

- *This not only ensures that the equipment is compatible with the Telecom network and other equipment connected to the same line, but also that it is electrically safe.*



(3) All wiring shall comply with Section 2 of this Code of Practice.

(4) Gate entry systems shall be connected on the customer's side of the network demarcation point. It is NOT permissible to divert the network lead-in cable between the Telecom network cable terminal on the road frontage and the Telecom network demarcation point at the building entry point.

- *Where a gate entry system is to be installed for a new building, especially if it has a long driveway, the recommended approach is to co-ordinate the lead-in and gate entry cable installation with other building services work. This allows the several services concerned to share the lead-in cable trench, which is paid for by the customer. The gate control installation contractor can then run the necessary control and communication wiring before the trench is closed.*

### **3.2.5 Door and Gate entry control systems for two or more customers**

(1) Where the door or gate entry control system is common to more than one Telecom customer, it may be necessary to divert those customers' lines into that system in order for those customers to jointly use the system. Suitable arrangements need to be put in place to ensure that such cable diversion does not impact on the reliability of Telecom services to those customers or on Telecom's ability to overcome any faults that arise in the diverted cabling.

- *This arrangement may arise at such locations as blocks of flats or retirement villages housing a number of individual customers, where each customer has independent control of the door or gate security.*

(2) Customers' lines shall not be diverted into such systems without the express authority of Telecom and the formal agreement of all the customers concerned.

(3) All gate and door entry control system equipment intended to be connected to the Telecom network shall be Telepermitted. In addition, special contractual conditions will apply to the grant of the Telepermit as regards the cabling arrangements, ongoing maintenance by the control system contractor and clear demarcation between that party's responsibilities and those of Telecom.

- *The suppliers of such systems should contact Access Standards for further details, as these are outside the scope of this Code of Practice.*

## **4. SOHO CABLING SYSTEM**

### **4.1 General**

#### **4.1.1 Outline**

(1) The basic Small Office Home Office (SOHO) cabling system is specified in AS/NZS 3086:1996. This is, in many ways, a sub-set of "Generic cabling for commercial premises", as specified in AS/NZS 3080 (IEC 11801), but with commoning facilities and no backbone cabling. It is essentially a "star-wired" RJ 45 system, primarily intended for voiceband applications and usually also providing RJ 45 sockets at the star point to permit cross-connections by means of patching cords.



- *AS/NZS 3086 was derived from the American standard EIA/TIA 570 and still closely follows US practices. These provide for four exchange lines and commonly make use of multi-line telephones or adapters, which are rarely used in New Zealand. In view of this, several variants of this standard are used locally.*

(2) SOHO cabling systems, as currently used in New Zealand and overseas, are frequently extended to provide for Local Access Network (LAN), audio, video and home control system distribution within the premises. Where these services have no connection with the Telecom network, their cabling and cross-connection are not covered by this code of practice, nor is the hardware or cable subject to Telepermit requirements.

- *Telecom has no involvement or responsibility for the co-axial cabling and hardware used in many of these systems. Their installation and maintenance is left to the customer to arrange.*

(3) AS/NZS 3086: 1986 provides for four exchange lines, but this is not mandatory for Telepermit purposes and suppliers may equip more or less capacity, as required by the customer.

(4) SOHO provides for any number of telecommunications outlets (jackpoints) of the RJ 45 type, all located within a single building. Each RJ 45 jackpoint is star-wired to facilities for commoning or cross-connecting the jackpoints, either separately or in groups, to network services or other common equipment.

- *In residential applications only, AS/NZS 3086 permits additional jackpoints in the same room may be daisy-chain connected from the first jackpoint in that room. However, this is not recommended in view of the likelihood that each jackpoint could be required for different services in the future.*

(5) The basic designs of SOHO and any similar wiring system hardware connected to the Telecom network shall meet the requirements of Telecom specification PTC 225 and be Telepermitted in accordance with section 106 of the Telecommunications Act 2001 and AS/NZS 3086 clause 5.3.2.3. Such products shall bear a Telepermit label.

- *Telecom specification PTC 225: 2003 is available free of charge from <http://www.telepermit.co.nz/PTC225draft.pdf>*

#### **4.1.2 Application**

(1) AS/NZS 3086: 1986 for SOHO was primarily intended to support standard telephone service and ISDN S/T bus reticulation, within certain limitations. It can be extended to support LAN data connections and future broadband network services, many of which are likely to be Ethernet-based.

- *AS/NZS 3086 is due for replacement in 2004. The new edition will be more closely aligned with AS/NZS 3080 (ISO/IEC 11801).*

(2) SOHO standardises 4-pair connections to the RJ 45 jackpoints, using the EIA/TIA 568A option, which is recommended as the standard for Australia and New Zealand. Unfortunately, there are other pair configurations in common use. The most prevalent of these is the 568B option. Indiscriminate use of both options within the same premises will cause operating difficulties with some services.

(3) To avoid such problems, the option used shall be clearly marked on the SOHO panel and in any user instructions or cable records.

(4) AS/NZS 3086 reserves pairs 1 and 2 for network services. This conflicts with the standard connections for Ethernet LAN applications, which use pairs 2 and 3. This is not a problem where Ethernet jackpoints and PSTN/ADSL jackpoints are separated and clearly marked according to their function.

(5) Users may need adapters for the connection of common CPE, not only to correct differing connection configurations, but also to provide for BT sockets for existing BT plug-connected CPE. Furthermore, older 3-wire connected telephones will need a “mastering” adapter to provide their ringing function.

(6) While SOHO provides connection flexibility for users of multiple applications, the location of jackpoints is relatively inflexible. Moving an existing jackpoint or providing an additional one, would almost invariably require a new cable run back to the distribution point, because joints are not permitted.

- *For maximum flexibility during new building work, it is recommended that jackpoints and cabling additional to immediate requirements be provided at all potential CPE locations while the framing is still accessible for cable runs.*

### 4.1.3 Support

(1) At present, Telecom does not offer routine maintenance support for SOHO installations, and this class of wiring is excluded from Telecom’s residential wiring maintenance service. In accordance with consumer protection legislation, installers shall warn their customers of the above limitations of SOHO cabling and be prepared to provide after sales support and ongoing maintenance.

(2) All SOHO and similar wiring installations shall be provided with clear installation instructions and facilities for recording the service connected to each jackpoint.

## 4.2 Technical Requirements

### 4.2.1 Materials

(1) Cable shall be 4-pair of Cat 5 or higher performance for both residential and commercial wiring, since this is now the recognised “industry standard”. All such cable shall bear an industry-recognised certification mark and performance rating on its sheath in accordance with international standards.

- *Telecom accepts that any cable so marked is equivalent to its Telepermit requirements, subject to (2) below. As such, it may be used for residential cabling installations connected to the Telecom network.*

(2) Cables which contain cellular insulation shall not be used because of the risk of total failure should water penetrate the sheath. In this event repair is not possible without replacing the whole cable run.

(3) Cable cross-connecting and commoning hardware components shall be Telepermitted in accordance with PTC 225.

(4) Because RJ 45 jackpoints are obviously purpose-designed for telecommunications purposes and NOT covered by Telecom’s wiring maintenance service, no mandatory requirements have been set for these components. However, it is strongly recommended

that all RJ 45 jackpoints used are substantially sealed against dust and dirt falling onto exposed electrical conductors.

(5) Where it is likely that subsequent jackpoint installation work will be carried out by customers not having the appropriate special insertion tools, jackpoints with “tool-less” terminations IDC are recommended.

#### **4.2.2 Installation Requirements**

(1) The requirements Part 2 of this Code shall be complied with.

(2) The transmission performance of categorised cable is highly dependent upon the cable not being deformed prior to, during, or following installation. This sets three conditions:-

- (a) During installation, pulling tension shall not exceed 110 N (approx 11 kg).
- (b) At any changes of direction, the bending radius shall be not less than 6 times the diameter of the cable.
- (c) The cross-section should not be deformed by clipping.

• (c) precludes the use of a wiring staple gun because of the variability of timber density and the possibility that the sheath will be crimped by a staple. Where additional support is required, preformed plastic saddles are recommended.

(3) A single 4-pair cable shall be run to the ETP with a minimum 1 m of slack cable held, and preferably concealed, at both ends of the run, in order to provide for the connection of future network equipment.

(4) It is recommended that provision is made for the following:-

- (a) accessible cable pathways to other parts of the premises in case it is necessary to install additional cables in the future;
- (b) space for future network equipment, routers and other LAN hardware, power supply units, etc, wherever there is a likely perceived need for the related services;
- (c) one or more 230 V power outlets or a multi-way socket outlet strip for this equipment;
- (d) space in front of the SOHO cabinet for easy service access

## 5. LEGACY WIRING SYSTEMS

### 5.1 General

#### 5.1.1 Obsolete pre-1983 Systems

(1) Following the era when installations comprised only a single telephone, a “plan wiring” system was introduced to provide for extension telephones. This was progressively extended to provide many optional features, including three successive generations of jackpoints. Wiring was complicated by parallel connection of transmission and dialling functions, with series connection of ringing functions.

(2) A few such installations are still in use and may remain so, provided they cause no service problems. Where repairs, additions or changes are needed, such “legacy installations” shall be fully converted to 2-wire and old equipment should be replaced with Telepermitted plug-in types of CPE.

#### 5.1.2 3-wire Installations

(1) To provide for simplified parallel connected wiring and for interchangeability of CPE, Telecom's 3-wire system using BT jackpoints was introduced in 1983.

(2) 3-wiring is based on the use of a single master jackpoint incorporating a shared ringing capacitor, which is used to derive a third wire to which CPE ringers are connected. This third wire causes an inherent capacitive unbalance to earth, which commonly causes noise induction and impairs fax and modem performance even when the noise is inaudible. More seriously, the shared capacitor limits the ringing current that can be drawn from the line, resulting in intermittent or poor ringing performance when several items of customer premises equipment are connected on the same line.

(3) Additional master jackpoints were sometimes added or substituted to overcome ringing impairments commonly experienced when new CPE was added to installations still containing bells designed for series operation. This caused other problems.

(4) When additions or changes are required, 3-wire installations shall be converted to 2-wire where:-

- (a) there is more than one master jackpoint on the same line; or
- (b) earlier types of CPE not bearing a Telepermit label are fixed wired or plug-connected to the line by other than a standard 6-way BT plug; or
- (c) a telephone is connected with a Telepermit in the PTC 202/88/xxx series;  
or
- (d) an extension bell having a dc resistance less than 2000 ohms is connected.

## 5.2 Expiry of 3-wire Telepermits

(1) Telepermits for 3-wire master jackpoints expired on 1 April 1999 and those for 3-wire extension jackpoints expired on 1 January 2000.

- *3-wire extension jackpoints are now only to be used for new work only in commercial installations where more than 2 wires are needed by the associated CPE.*

(2) 2-wire jackpoints provide a number of advantages as regards both reliability and service performance. Despite the need to replace all existing 3-wire jackpoints, Telecom strongly recommends full conversion to 2-wiring whenever the opportunity arises.

- *3-wire installations generally require full conversion to 2-wire in the event of a fault or other performance impairment.*

## 5.3 Extending a 3-wire Installation

(1) Where a 3-wire installation qualifies for extension in terms of clause 5.1.2(4) above and full conversion to 2-wire is not chosen, existing installations may be extended by installing additional 2-wire jackpoints, but only where these are not connected on the network side of existing 3-wire jackpoints and where different wire gauges are not required in the same terminal slot of an existing 3-wire jackpoint.

(2) The additional jackpoints shall not be connected to an existing 3-wire jackpoint if:

- (a) it has more than one cable already terminated on it; or
- (b) the cables have conductors of differing gauges.

If these two requirements cannot be complied with, the existing 3-wire jackpoint at which the connection was to be made shall be replaced with a 2-wire jackpoint.

- *The existing cable and the new cable used may be either 2-pair or 3-pair*
- *Existing cable will generally have red, white, blue and green coloured insulation with 0.4 mm conductors, whereas modern cable has 0.5 mm conductors, with a blue & blue/white and an orange & orange/white pair. On 3-wire jackpoints, the red wire connects to IDC 2, the blue wire to IDC 3 and the white wire to IDC 5.*

(3) Where the existing 3-wire jackpoint and 0.4 mm cable can be used, the red wire is connected to IDC 2 and the white wire to IDC 5. Other wires are not connected. At the 2-wire jackpoint, the red wire is connected to the right hand IDC assembly and the white wire to the left hand IDC assembly, as for standard 2-wire but with red instead of blue.

(4) Interconnections are made by simply daisy-chaining one pair of wires from one jackpoint to the next, terminating each wire colour in the same relative position or terminal number and so connecting all jackpoints electrically in parallel.

(5) Additional jackpoints connected beyond the first 2-wire jackpoint may be daisy-chain or tee-off connected and should preferably use 2-pair cable 0.5 mm conductor cable Telepermitted to PTC 222.

(6) All other requirements of Part 2 of this Code shall be complied with, including no more than one wire to each 2-wire jackpoint IDC slot and each new 2-wire jackpoint being marked with the date of installation.

## **5.5 Conversion to 2-Wire**

### **5.5.1 General**

(1) The simplest approach is to use 2-wire jackpoints to replace all 3-wire jackpoints and any remaining connections to fixed wired telephones, using existing cables as far as possible.

(2) Existing fixed wired telephones contain bells which are designed for series operation and severely limit the ringing performance of other CPE on the line.

- *Any fixed wired telephones still being rented from Telecom may be exchanged for a modern plug-in telephone at any Post Shop.*

- *Those early telephones which are privately owned and Telepermitted may be retained, but require a plug-ended cord to be fitted. Dial-type telephones will not be supported by the Telecom network in the future. It is strongly recommended that they be replaced with modern plug-in types whenever the opportunity arises.*

(3) Existing fixed wired extension bells are also likely to contain mechanisms designed for series operation and should be removed. Where still needed, inside types may be replaced with a Telepermitted electronic plug-in type, with an additional jackpoint provided for its connection. The function of outside bells has largely been replaced by cordless telephones, but if bells are still required they should be replaced with a weatherproof Telepermitted version containing a series capacitor and connected to the fixed wiring in accordance with clause 2.3.9.

(4) Existing plug connected or fixed wired series CPE may remain.

(5) Conversion shall follow the requirements of Parts 2 and 3 of this Code, subject to some dispensations specified hereunder.

### **5.5.2 Cabling**

(1) At each location of fixed wired CPE or 3-wire jackpoints to be converted to 2-wire jackpoints, the existing wiring shall have conductors of diameter 0.4 to 0.65 mm for termination on the replacement 2-wire jackpoints.

(2) Where Telecom staff are called on to carry out conversion, lead-in or other cable having a larger diameter should be replaced by new 2-pr cable back to the ETP or its point of connection. The same applies to lead-in cable which is not grease filled. Suitable grease filled connectors shall be used to connect 2-pr cable to such lead-in types.

(3) Cabling to the locations of any equipment not being used following conversion, shall be totally disconnected at the point of connection to wiring being reused. This prevents wiring unbalance caused by the former ringing wire.



### 5.5.3 Jackpoints

(1) Provide 2-wire jackpoints at the previous terminating points, which are being retained. These should be moved to comply with minimum height requirements when sufficient cable length is available and wall damage at the previous location is easily repaired.

(2) The only wires to be re-terminated on the 2-wire jackpoints are the pair used for the line. For identification, when connected to the network an idle line provides 35 to 50 Vdc across the pair. Colours may vary in older cables, with red and white followed by green and white, being most common. On 3-wire jackpoints, they are the wires connected to IDC slots 2 and 5.

(3) To assist prevention of water entry from the cables, the requirements of Part 2 for cable entry from below, and with all parts of the cable sheath and spare wires confined below and clear of the PCB, shall be followed where possible.

- *Should corrosion be evident in any jackpoint being replaced, the above requirements are more important. In this case, the original cable is likely to be wet and should preferably be replaced with new cable routed clear of wet areas in accordance with clauses 2.3.4 to 2.3.6.*

(4) The insulation of wires being re-terminated shall be undamaged across the full width of the IDC slot.

(5) Connect each selected pair of line wires, one wire to the each IDC assembly, in the same corresponding slot for each cable. Connect only one wire to each slot. Three pairs of slots are available. The polarity is not important, but for consistency, the white wires of pairs should use the left side assembly.

(6) Outside cable to weatherproof equipment may be connected to any convenient 2-wire jackpoint having a pair of spare IDC slots.

### 5.5.4 Additional Jackpoints

Any additional wiring to jackpoints or elsewhere is covered by and shall comply with Parts 2 and 3 of this Code.

### 5.5.5 Tests of Wiring

Converted and additional wiring shall be tested for correct functionality before fixing jackpoint faceplates in position. Tests should include the ability to initiate calls and receive ringing at all jackpoints.

#### 5.5.6 System performance

(1) All CPE associated with wiring converted to 2-wire will perform at least as well as it did prior to conversion. If not, a wiring error exists.

- *Some first generation cordless phones may ring once, when certain other CPE on the line goes from on-hook to off-hook, or vice versa. Due to age and non-availability of spare batteries, it is expected that very few of the types affected still exist. When encountered and the effect is unacceptable, the cordless phone should be replaced with a more recent model.*

(2) Because of the poorer performance of earlier types of existing cabling and likely degradation during its service life, converted installations may not perform as well as those fully conforming 2-wire installations. The aspects which may be affected include

reliability and noise performance. Continued use of long obsolete CPE may limit ringing to other more modern CPE.

### END OF CODE OF PRACTICE PTC 103

