INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF SINGAPORE

TELECOMMUNICATIONS ACT

(CHAPTER 323)

GUIDELINES FOR INTERNAL TELECOMMUNICATION WIRING 2014

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GUIDELINES FOR INTERNAL TELECOMMUNICATION WIRING 2013

The Info-Communications Development Authority of Singapore ("IDA"), pursuant to Section 28 of the Telecommunications Act (Cap. 323) ("Act"), hereby issues these Guidelines for Internal Telecommunication Wiring 2013 ("Guidelines").

1. INTRODUCTION

This Section defines terms under in these Guidelines, specifies the legal effect of these Guidelines, reserves certain rights and provides the Effective Date and Short Title of these Guidelines.

1.1 Definitions

Unless otherwise defined in these Guidelines, capitalised terms used in these Guidelines have the same meaning as in the Code of Practice for Internal Telecommunication Wiring 2013 ("IW Code").

1.2 Legal Effect of These Guidelines

The provisions contained in these Guidelines are advisory; they do not impose any binding legal obligations on IDA or any private party. Rather, these Guidelines are intended to clarify on the detailed specifications and process related to the installation of the telecommunication wiring which telecommunication wiring contractors/installers are to provide IW Code. These Guidelines is to be read together with the IW Code which sets out the mandatory requirements in respect of the installation of respective telecommunication wiring. Nothing in these Guidelines shall waive any telecommunication wiring contractors/installers of its obligation to comply with the provisions of the IW Code. In the event of any conflict between the IW Code and these Guidelines, the provisions of the IW Code will prevail.

1.3 Modifications of These Guidelines

The specifications and processes laid down in these Guidelines are based on existing policies and circumstances relating to the current and presently anticipated states of technological development, infrastructure deployment and service provision of the telecommunication system licensees. As such policies and circumstances may change with technological advancements and differing service demands, IDA reserves the right to amend, add or remove any of the procedures, specifications and standards set out in these Guidelines from time to time.

1.4 Effective Date of These Guidelines

These Guidelines will take effect on the date of issue of these Guidelines.

1.5 Short Title

These Guidelines may be referred to as the “IW Guidelines”.

2. REQUIREMENTS FOR TELEPHONE WIRING

2.1 Surface Cabling and Concealed Cabling Methods

The following sections show the different ways that cables shall be installed and distributed in a building via surface and concealed cabling methods.

2.1.1 Exposed surface cabling

2.1.1.1 Exposed surface cabling shall be installed along the wall surfaces by means of staples or cable clips. Staples shall be used for attaching telephone cables (4-wire, 6-wire & 8-wire) onto wood or partitions. The cable clips shall be used for securing cables onto concrete or plaster surface.

2.1.1.2 To prevent the wire from sagging, the staples or cable clips (3.5mm) shall be spaced evenly at 350mm interval. The staples or clips near a corner shall be spaced about 25mm away from the corners as illustrated in Fig.2-1.

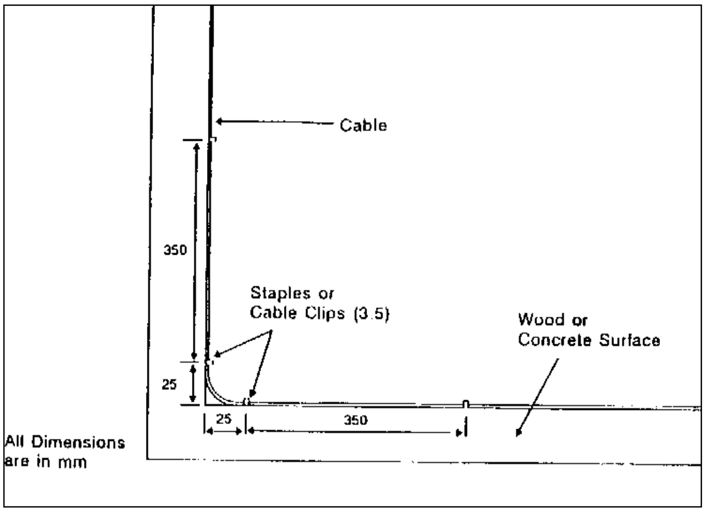

Fig.2-1 Staple/cable clip spacing

2.1.1.3 The cables shall be routed horizontally or vertically along doorframes, wall corners and skirting. To run a cable from one room to the next, a hole shall be drilled through the wall just above the doorway or in the angle between the doorframe and the skirting board. No cable shall be run through the doorway. The door or door frame shall not be cut to accommodate any cables running through it.

2.1.2 Installation of cables using PVC casing and batten

2.1.2.1 PVC casings/battens shall be installed either horizontally or vertically.

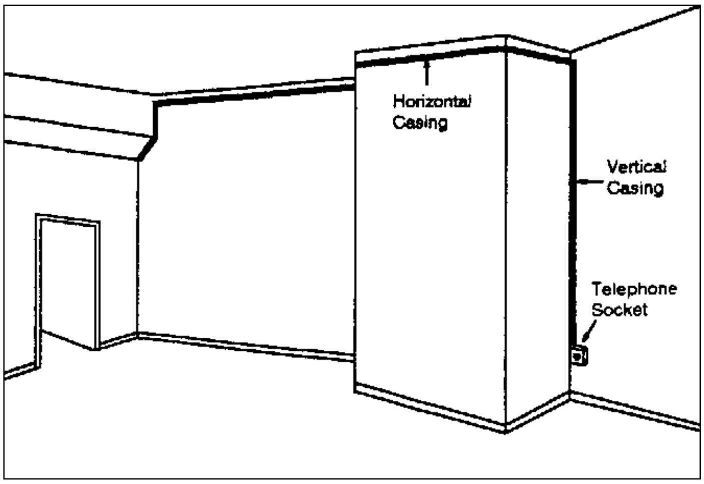

Fig.2-2 PVC casing/batten installation

2.1.2.2 PVC casing/batten shorter than 300mm shall be fixed with at least two nails.

2.1.2.3 Where a batten is used, the cables shall be secured onto the batten by using saddles fixed with brass nails at 250mm distance.

2.1.2.4 The nail at the end of the casing shall not be more than 100mm from the end.

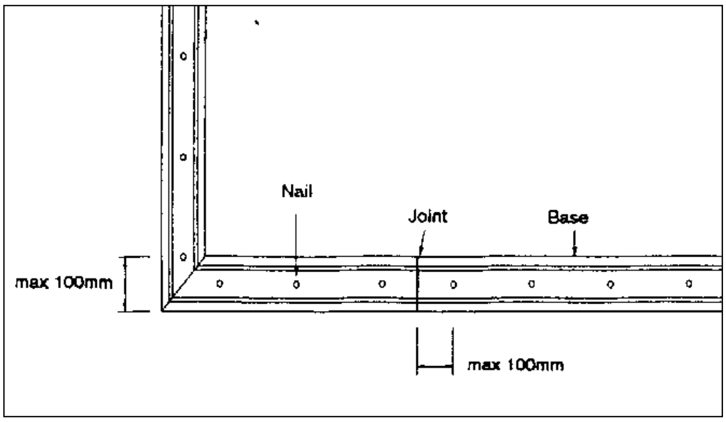

Fig.2-3 Spacing of nail from batten end

2.1.2.5 Where a batten is installed through an opening in the building structural beam, the batten shall be of sufficient length without any joint in the opening and its length shall be such that there is 100mm length of batten at each end of the opening.

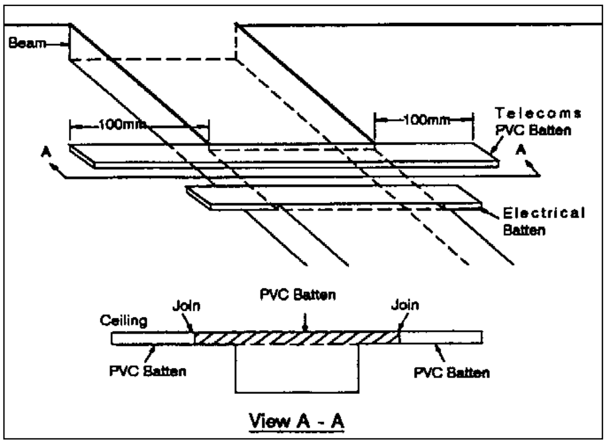

Fig.2-4 Batten through a beam

2.1.2.6 All angular joints shall be cut and formed to conceal the cables fully on the batten or in the PVC casing.

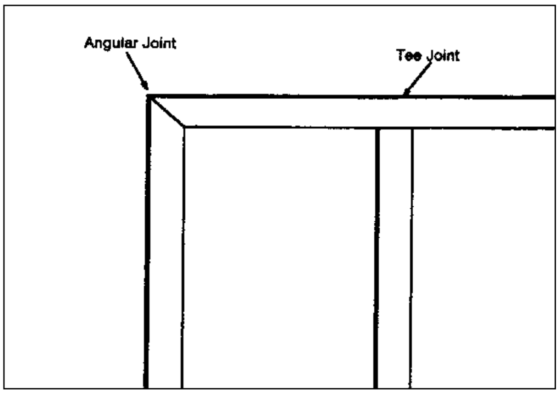

Fig.2-5 Angular joints in batten

2.1.2.7 Where batten and other services' casing, conduit, trunking, duct etc intersect, a crossover shall be constructed to bridge the batten.

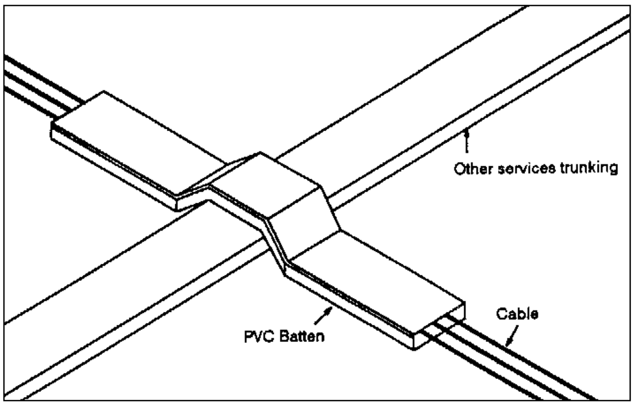

Fig. 2-6 Crossover of batten

2.1.3 Installation of cables in multi-compartment PVC trunking

2.1.3.1 When installing telephone cables using multi-compartment PVC trunking, the telephone cables shall be segregated from the electrical cables.

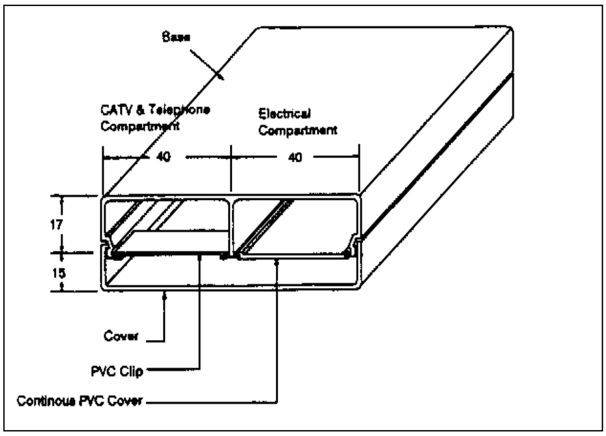

Fig.2-7 Multi-compartment PVC trunking

2.1.3.2 Continuous clips shall be provided throughout the electrical compartment of the trunking to provide segregation of the cables.

2.1.3.3 Electrical connectors shall not be installed in the telephone-cable compartment.

2.1.3.4 Trunking running along the wall shall be installed with the electrical compartment nearer to the brim of the wall.

2.1.3.5 A continuous clip with a length of at least 150mm shall be provided in the telephone-cable compartment where electrical cables cross over telephone cables.

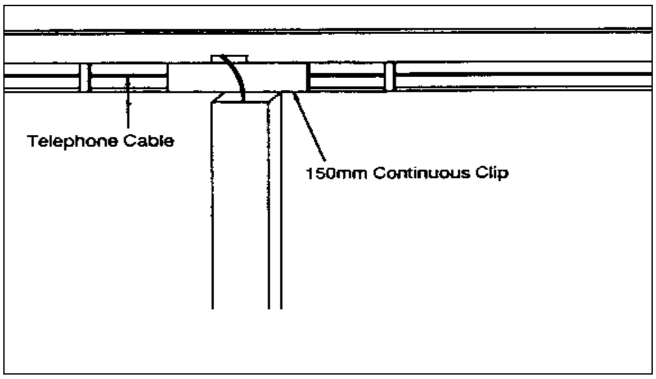

Fig. 2-8 Provision for continuous clip

2.1.3.6 A minimum of 7 nails shall be driven on a standard length of 2m PVC casing.

2.1.3.7 PVC saddle clips shall be fixed at intervals of not more than 250mm and not more than 125mm from both ends.

2.1.3.8 For a standard length of 2m PVC trunking, a minimum of 8 clips shall be fixed on the trunking.

2.1.4 Installation of cables in exposed cable tray

2.1.4.1 Cables shall be arranged neatly on the tray with no slack.

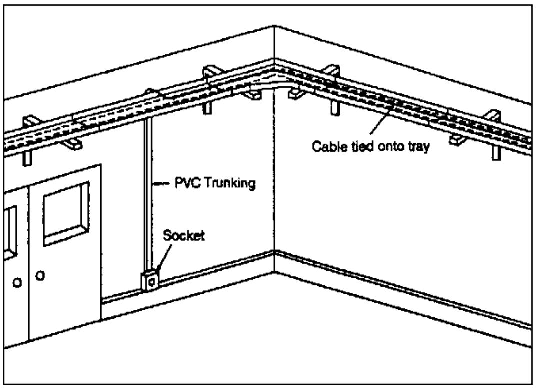

Fig.2-9 Cables in exposed cable tray

2.1.5 Installation of cables in conduit

2.1.5.1 The cable shall be extended through the cover of the junction box to the desired telephone position with PVC casing.

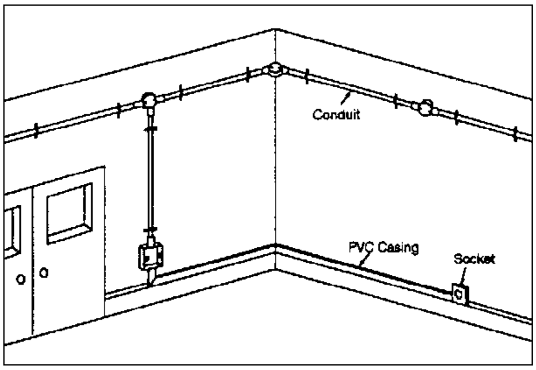

Fig.2-10 Cables in conduit

2.1.6 Installation of cables in exposed trunking

2.1.6.1 Cables shall be left with minimal slack in the trunking or else there will be reduction in the trunking capacity and cause difficulty in installation for subsequent cable.

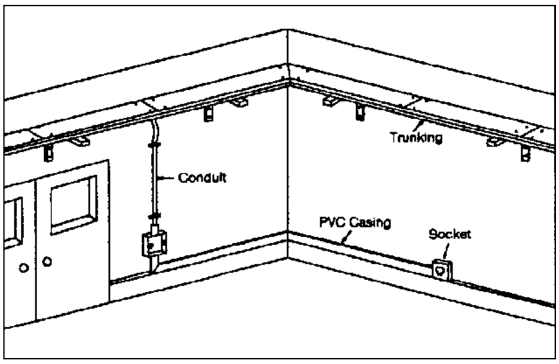

Fig.2-11 Cables in exposed trunking

2.1.7 Installation of cables in Cellular Floor System

2.1.7.1 The Cellular Floor System has a floor structure consisting of cells spaced evenly all over the floor area. The cables are run in the cavity of the cell.

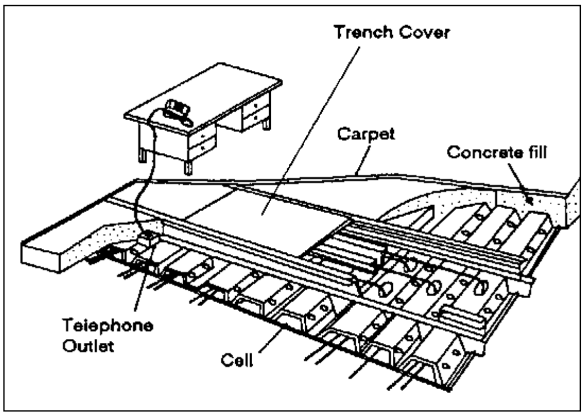

Fig.2-12 Cables in Cellular Floor System

2.1.7.2 The trench/duct provides access to floor cells which run at right angles to it.

2.1.7.3 The location of the trenches shall be located in an easily accessible position for the convenience of future installation and maintenance works.

2.1.8 Installation of cables in Raised Floor Distribution System

2.1.8.1 Cables shall be laid in an orderly manner on the floor space below the raised floor or on cable trays provided.

2.1.8.2 Cables laid on the floor shall be bundled or tied together.

2.1.8.3 Telephone cables laid on the floor shall be isolated from cables of other services. The separation of the cables from other service is essential for safety reasons.

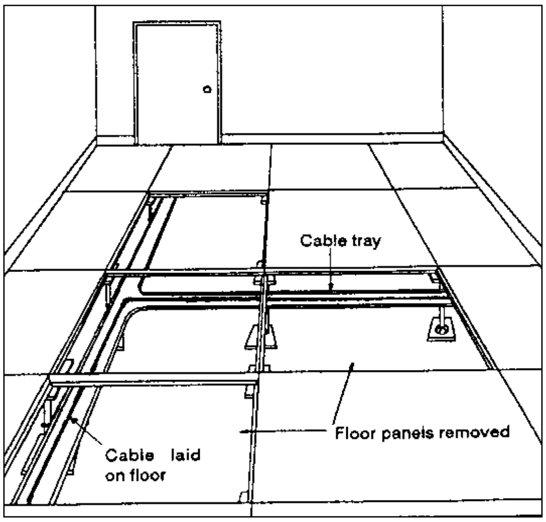

Fig.2-13 Cables in Raised Floor Distribution System

2.1.9 Installation of cables in Ceiling Distribution System

2.1.9.1 Cables laid on the cable trays shall be properly arranged and secured with cable ties.

2.1.9.2 Cables shall be extended through a conduit or other facilities provided to the desired telephone socket position.

2.1.9.3 When PVC casings are used to conceal the cables along the wall surfaces, a slot shall be made at the corner of the ceiling board to bring the cables from the cable tray to the PVC casing.

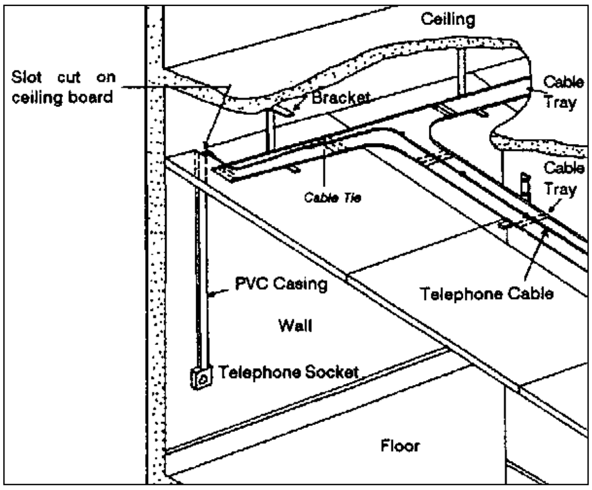

Fig.2-14 Cables in Ceiling Distribution System

2.1.9.4 When a conduit is used, cables from the tray shall be extended to the desired position through the conduit installed inside the partition.

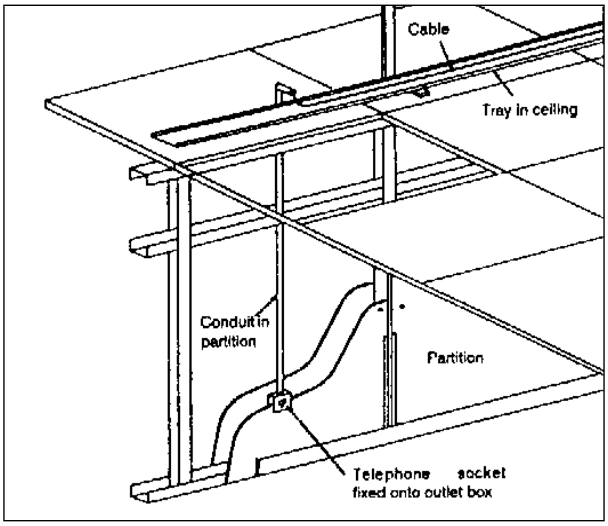

Fig. 2-15 Conduit in partition

2.1.10 Installation of cables in Utility Poles

2.1.10.1 The variation in the cabling procedure for differing poles shall depend on the method of gaining access into the cavity of the pole.

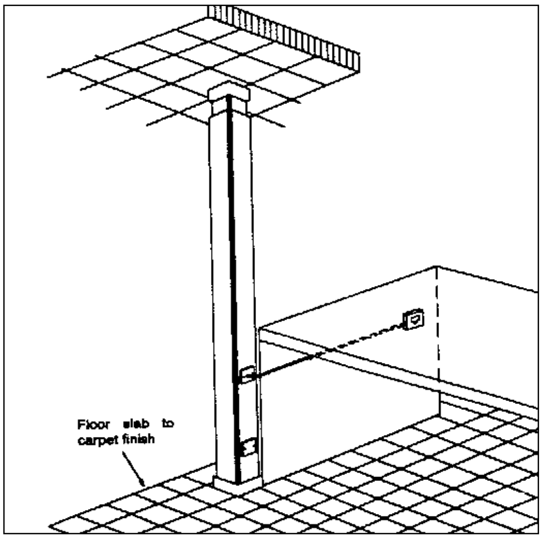

Fig.2-16 Cables in Utility Poles

2.2 Termination of Cables onto Different Types of Terminals

2.2.1 Wrapping terminal

2.2.1.1 A wrapping gun shall be used to wrap wires around the sharp corners of the terminals.

2.2.1.2 The number of turns shall not be less than 6 turns.

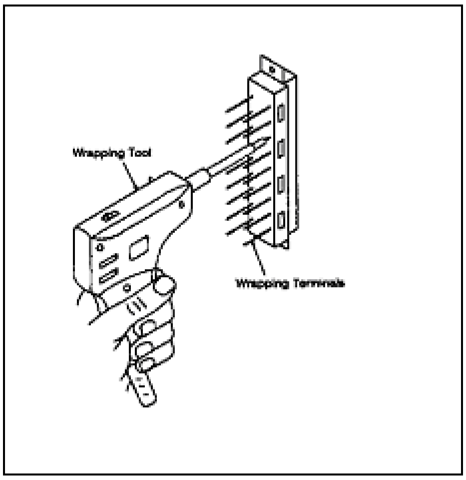

Fig.2-17 wrapping gun in use

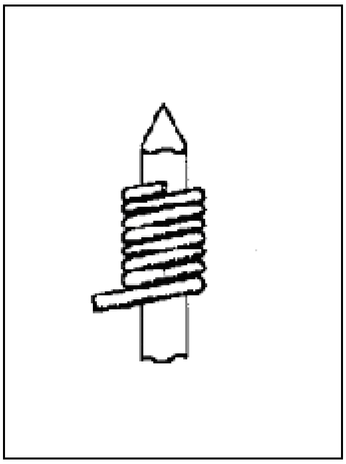

Fig.2-18 Number of turns

2.2.2 Soldering terminal

2.2.2.1 To connect a wire onto a soldering terminal, the conductor of the wire shall first be threaded through the hole on the terminal if a hole is available and wrapped once round the notch before applying the solder to the wire.

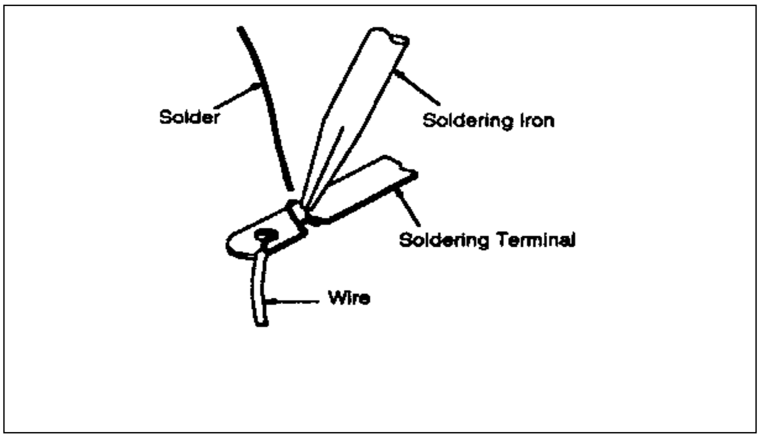

Fig.2-19 Soldering of terminal

2.2.3 Quick-Connect terminal

2.2.3.1 The wires to be terminated shall be punched or inserted into the slot of the contact terminal with a spring-loaded impact tool or an insertion tool meant for such terminal.

2.2.3.2 The edge of the slot cuts the insulation of the wire as it passes through the terminal and the contact between the terminal and the conductor is made.

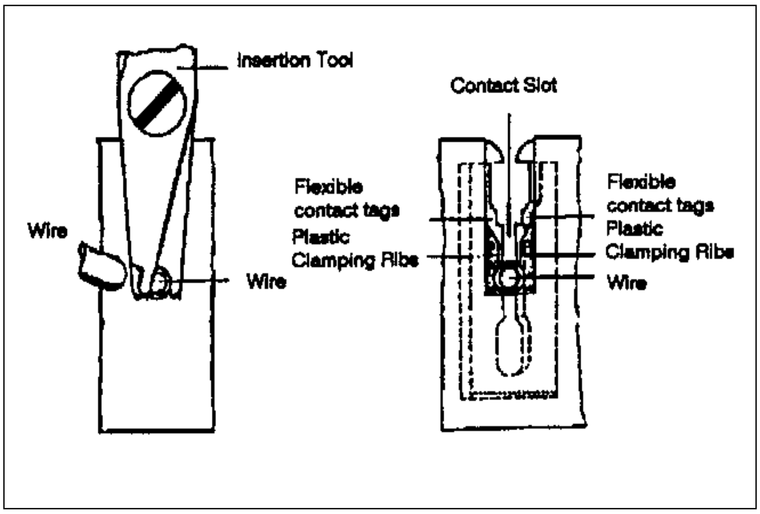

Fig.2-20 Termination of wire onto Quick-Connect terminal

2.2.4 Screw terminal

2.2.4.1 The length of the part of wire with insulation removed shall be sufficient to enable the bare wire to wrap round the screw in a clockwise direction.

2.2.4.2 Where the terminal consists of multiple pairs of screw terminals, the installer shall ensure that the process of terminating the 2 wires onto the terminals shall result in the connection of a twisted-pair wire to the correct pair of screw terminals.

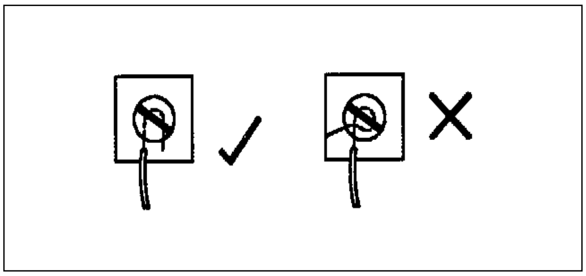

Fig.2-21 Termination of wire onto Screw terminal

2.3 Termination of Cables onto Different Types of Block Terminals/ Distribution Cases

2.3.1 Termination of Cables onto 2-pair Screw-Type Block Terminal

2.3.1.1 The exchange line from the DP shall be terminated onto terminals 5 and 6 .The cable from the telephone socket shall be secured to terminals 1 and 2.

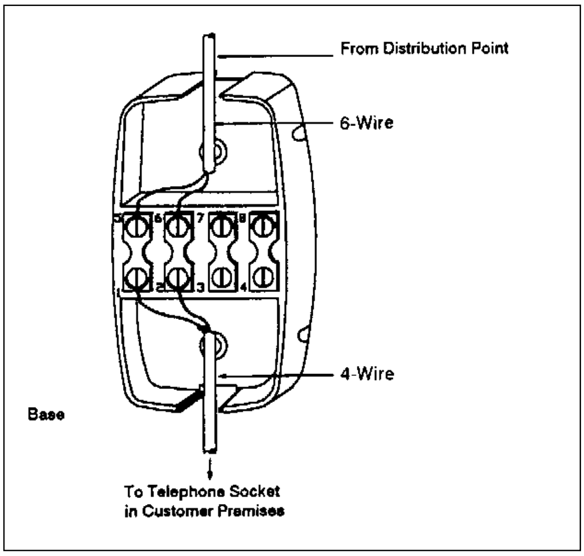

Fig.2-22 Termination of cables onto 2-pair Screw Type BT

2.3.2 Termination of Cables onto 10-pair Screw-Type Block Terminal

2.3.2.1 Spare cable pairs shall be coiled around the working pairs of the same cable and be sufficiently long for future terminations.

2.3.2.2 Cable shall be terminated with 20-30mm slack to avoid straining of the wire.

2.3.2.3 The sheath of the cable shall be removed up to the cable entry point.

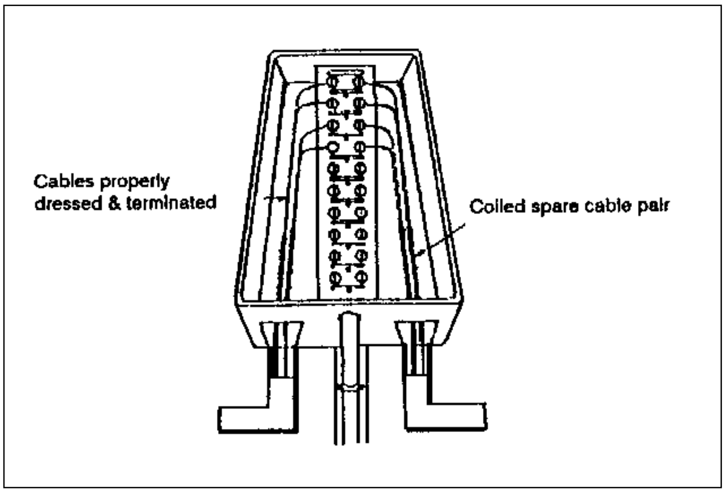

Fig.2-23 Termination of cables onto 10-pair Screw Type BT

2.3.3 Termination of Cables onto 10-pair Quick-Connect Block Terminal

2.3.3.1 The individual wires of the 10-pair cable and the 4-wire cables shall be terminated directly onto the terminals by an insertion tool.

2.3.3.2 The sequence of termination is illustrated below.

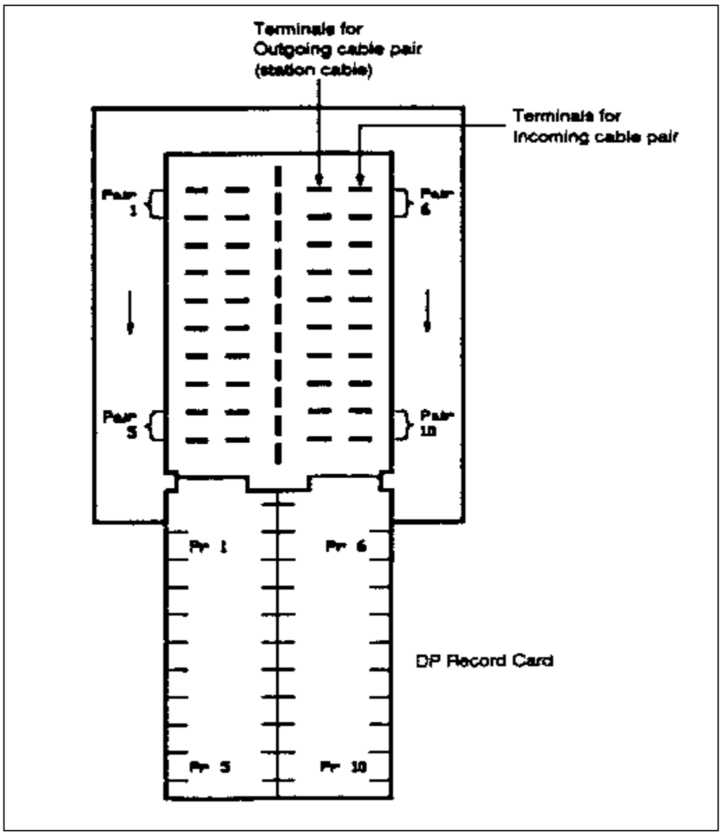

Fig.2-24 Termination of cables onto 10-pair Quick-Connect BT (BT68a)

2.3.4 Termination of Cables onto 20/40-pair Quick-Connect Distribution Case

2.3.4.1 The cables shall not be run across the faces of the terminal strips.

2.3.4.2 Wires of the same pair shall not be split.

2.3.4.3 Cables shall be terminated with 20-30mm slack.

2.3.4.4 The length of any spare cable pairs not wired to terminals shall be sufficient to reach any terminals and coiled around the working pairs of the same cable.

2.3.4.5 Each cable shall pass through the guides provided and follow the raceways formed by the space between modules in the following manner:

Pair 1 to 5 through the jumper rings on the left and pair 6 to 10 through the jumper rings on the right.

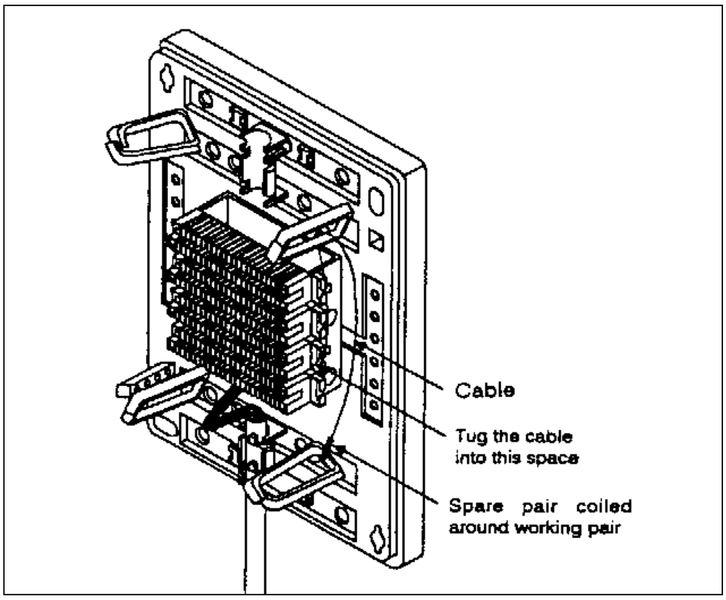

Fig.2-25 Termination of cables onto 20/40-pair Quick-Connect Distribution Case

2.4 Functional Tests

This section describes the procedures to be followed to carry out Continuity Test, Open Circuit Test and Insulation Resistance Test.

2.4.1 Continuity Test

2.4.1.1 The following steps shall be followed:

(a) Create a loop at the DP end of the wire by connecting the WH ‘A’ and BL ‘B’ wires together. (Note: these wires must be disconnected from DP terminal during the test.)

(b) Plug in the Tone Test Set to the socket and set the function switch to Resistance Mode as shown in Fig.2-26

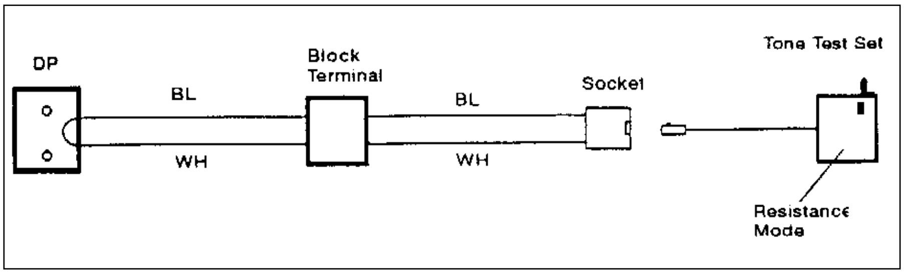

Fig.2-26 Continuity Test

2.4.1.2 Test Results

(a) If a tone is generated, the cabling is in good condition.

(b) If no tone is generated, the cable has an open circuit. Trace the fault and repeat the Continuity Test procedures after rectification.

2.4.2 Open Circuit Test and Insulation Resistance Test

2.4.2.1 Steps:

(a) Remove the short circuit connection on the WH`A' and BL`B' wires that has been test under the Continuity Test at the DP end. (Note: WHITE `A' and BLUE `B' wires must be disconnected from DP terminals).

(b) To determine the reference value of 1 MΩ Insulation Resistance, touch the red clip lead to the screw head of the Tone Test Set. Beep tones can be heard to indicate a value of 1 MΩ Insulation Resistance.

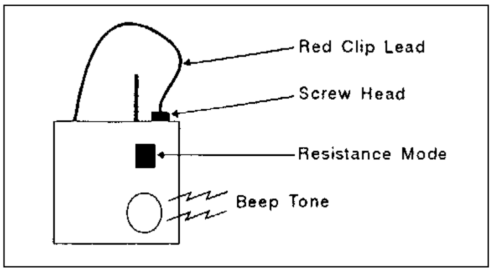

Fig.2-27 Obtaining reference value of 1 MΩ Insulation Resistance

(c) Do not remove the Tone Test Set from the socket and set the function to Resistance Mode as shown.

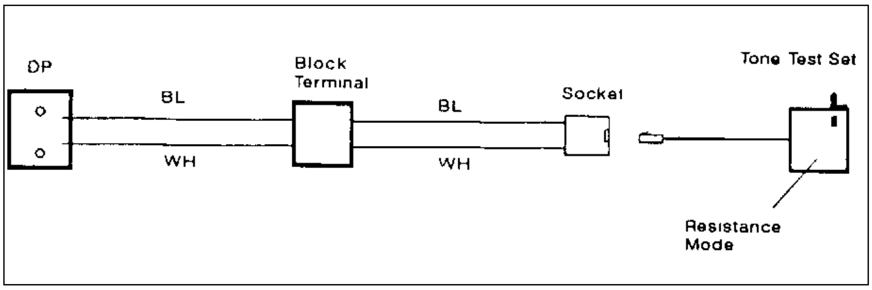

Fig.2-28 Open Circuit and Insulation Resistance Test

2.4.2.2 Test Results

(a) If no tone is generated or the interval between tones is slower than the reference value, the cabling is in good condition.

(b) If a tone is generated or the interval between tones is faster than the reference value, the cable has a short circuit or low insulation resistance. Trace the fault and repeat the Open Circuit Test and Insulation Resistance Test procedures upon rectification.

2.5 Telephone Cables and Block Terminals

This section provides guidance on the size of telephone cables and associated block terminals to be installed.

A Guidelines on the Size of Cables and the associated Block Terminals/Discases for Business Premises

No. of Lines applied (per Premises Basis)	Cable size to be installed from DP to Doorstep	Size of Block Terminal (BT)	
		Doorstep	Riser (DP)
1 to 3	8-wire	4-pair	Not Required (Direct Termination)
4	10-wire	10-pair	Not Required (Direct Termination)
5 to 8	10-pair	20-pair	20-pair
9 to 15	20-pair	20-pair	20-pair
16 to 32	40-pair	40-pair	40-pair
32 to 100	80/100-pair	100-pair	100-pair

Table 2-1

B Guidelines on the Size of Cables and the associated Block Terminals for Residential Premises

Type of Premises		Cable Size from DP to BT	Cable Size from BT to Socket	Size of BT	Cable Size from DP to Socket
HDB Flat (Non-Service Duct)		6-wire	8-wire	2-pair (doorstep)	-
HDB Flat (Service Duct)		-	-	-	8-wire
Private House	DP at car porch or store room in the house	1 Nos. of 8-wire	1 No. of 8-wire	5-pair BT - located inside unit	
	DP at gate pillar	1 No. 5-pair polyethylene cable			
Private Apartment & Condominium		1 Nos. of 8-wire	1 No. of 8-wire	5-pair BT - located inside unit	

Table 2-2

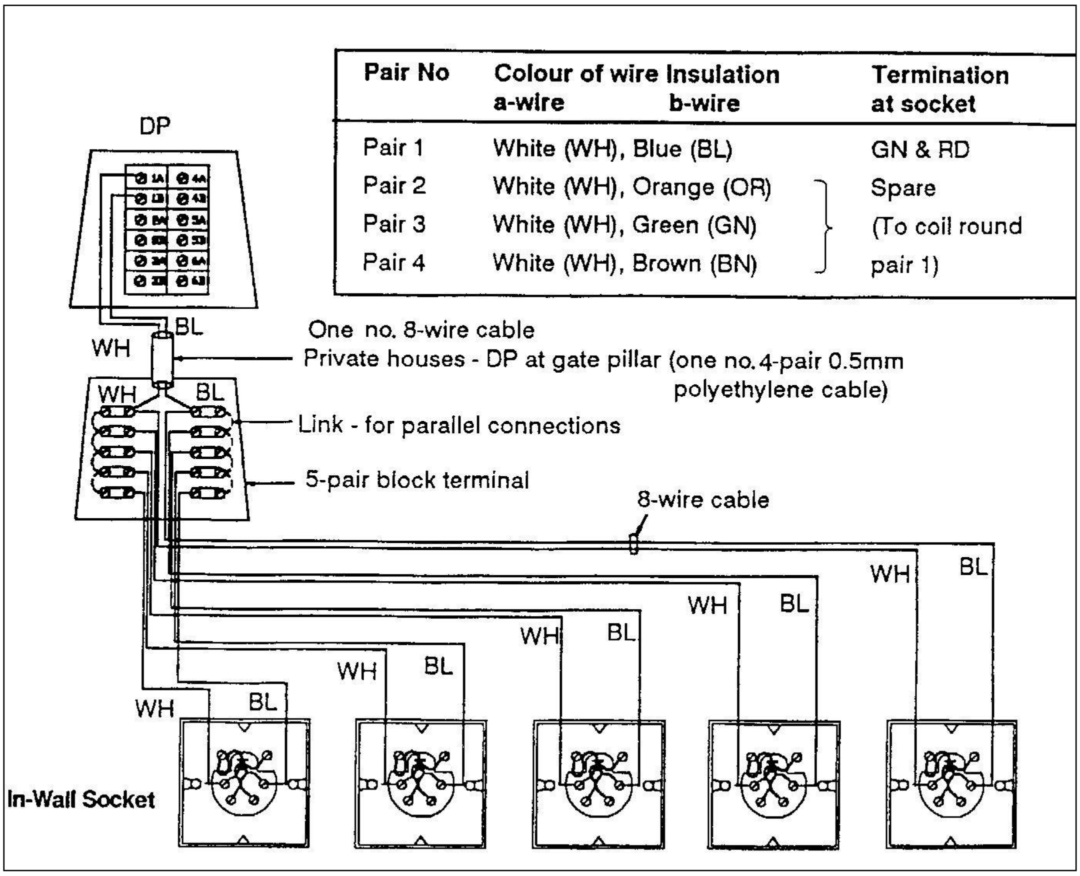

Fig.2-29 8-wire cable colour code and termination

3. REQUIREMENTS FOR BROABDAND COAXIAL CABLE SYSTEM

3.1 Additional Performance Requirements for Broadband Coaxial Cable System

This section describes the additional performance requirements that the installed broadband coaxial cable system should meet.

3.1.1 Carrier level differences

The differences in carrier levels shall not exceed the values given in Table 3-1.

If FM signals are present at the system outlet intended for television signals, the level of any carrier shall be at least 3 dB lower than the lowest television signal level at the system outlet.

Frequency Range	Maximum Level Differences (dB)
54 MHz to 824 MHz	16 (FCC76.605-a-4ii)
Adjacent Channel	3 (FCC76.605-a-4I)
Any 60 MHz range	6

Table 3-1 Maximum level difference at each system outlet between distributed television channels

3.1.2 Mutual isolation between system outlets

(a) General

The isolation at any signal frequency between the TV sockets of the two system outlets connected separately to a spur feeder via separate users' feeders shall be equal to or greater than 33 dB. The isolation between any TV and FM sockets (other than the two sockets at the same outlet) shall exceed 46 dB.

(b) Additional requirements if unwanted frequencies are unavoidable

When the channel allocations or channel conversions are such that the television or FM receivers' local oscillator fundamental or harmonic frequencies fall in the FM or television channels, the isolation at any signal frequency between two system outlets connected to a spur feeder via separate subscribers' feeders shall be at least 46 dB. Where the local oscillator signals fall in a FM channel, the signal level of the FM channel at the system outlet shall be at least 54 dBμV.

3.1.3 Frequency response within a television channel at any system outlet

(a) Amplitude Response

The amplitude response as a function of frequency for the entire system shall be such that the variation in gain over any television channel (bandwidth appropriate to the television system in use) is not more than ± 2dB relative to that at the vision carrier frequency, and gain shall not vary by more than 0.5 dB within any frequency range of 0.5 MHz. (FCC 76.605-a-6)

Note: Reception difficulties may impose selectively requirements on head end equipment which may cause these limits to be exceeded.

(b) Phase Response

The group delay variation within any TV channel shall not be more than 50 ns.

3.1.4 Frequency stability of distributed carrier signals

Where a signal is not distributed at the received frequency or is locally generated, the variation of the carrier frequency from the declared nominal due to the system equipment shall not exceed ± 30 kHz for a television signal or ± 12 kHz for a FM sound signal. Where the system carrier frequencies are generated locally, the frequency difference between vision and sound carrier for any one channel shall be maintained within ± 2 kHz of the nominal for the television system in use. When adjacent television channels are used, the frequency variation of each of the vision carrier shall not exceed ± 20 kHz.

3.1.5 Generation of spurious signals

Frequency converters shall conform to CISPR Publication 13 in respect to the level of R.F. voltage produced at their signal terminals at the fundamental and harmonic frequencies of their oscillators.

Note: Where the local oscillator frequencies and harmonics resulted in interference to the distributed frequencies, additional measures to reduce unwanted R.F voltage may be necessary.

3.1.6 Intermediate frequency interference

At any system outlet, the level of any signal in the I.F range of the television receivers shall be at least 10 dB lower than the lowest VHF television signal level and not higher than the lowest UHF television signal level.

3.1.7 Random noise

The carrier to noise ratio for systems from the head end input to the system outlets shall be not less than the value shown in Table 3-2. This carrier to noise ratio shall be obtained with a test signal applied at the system input equal in level to that normally available at that point except where the normal input is less than the minimum shown in Table 3-2, in which case the minimum levels given in that table shall be used.

System	Min. Carrier to Noise Ratio (dB)	Noise Bandwidth (MHz)
625-lines System B, G	47	5
FM sound (mono)	41	0.20
FM sound (stereo)	51	0.20

Table 3-2 Minimum carrier to noise ratio for TV and FM systems outlets

Note 1: Carrier to noise ratio expressed in decibels is defined as:

$$\frac{C}{N} = 20\log_{10}\left(\frac{carrier\ voltage}{noise\ voltage}\right)$$

Where the carrier voltage is the r.m.s value of the vision carrier at the peak of the modulation envelope of the r.m.s value of the FM sound carrier, and the noise voltage is the r.m.s value of the random noise in that channel.

Note 2:This value applies when the level at the system outlet is the minimum given in Table 3-2.

3.1.8 Interference to television channels

(a) Single-frequency interference to television channels
This section refers to single-frequency interference that may result from inter-modulation or the presence of interfering signals.
At any system outlet, the level of any unwanted signal generated within the system shall be such that the lowest carrier to interference ratio within a wanted television channel shall be not less than 60 dB, where this ratio is expressed as:

$$20\log_{10} = \left(\frac{r.m.s\ of\ vision\ carrier\ signal\ voltage}{r.m.s\ of\ interference\ voltage}\right)$$

and the voltages have those values occur at the peak of the modulation envelopes. However, where a frequency assignment taking account of known future off-air and distributed channels is adopted so that interference signals fall only in the less sensitive areas of the television channel spectra, a limit lower than that given above may be acceptable.

(b) Multiple-frequency inter-modulation interference

At any system outlet, the level of the multiple frequency intermodulation interference, in any wanted television channel, shall be such that the carrier to interference ratio shall be not less than 65 dB for 30 channel loading, measured according to IEC 728-1 Clause 9.

3.1.9 Cross-modulation between television channels

At any system outlet, the peak-to-peak amplitude of any unwanted modulation on a wanted carrier shall be at least 60 dB below the peak-to-peak amplitude of the wanted modulation for 30 Channels loading.

3.1.10 Differential gain and phase in television channels

The differential gain and phase in any television channel shall not exceed the figures as given in Table 3-3.

System	Max. Differential gain	Max. Differential Phase
PAL	**10 %**	**5^0**

Table 3-3 Differential gain and phase in television channels

3.1.11 Echoes in television channels

The echo rating as determined at any system outlet when measured by the method defined in Singapore Standard CP39:1994 shall not exceed 4%.

3.1.12 Data signal transmission

(a) In the context of this section "data" is taken as any pulse modulation digitally encoded signal regardless of original information format.

(b) Data signals carried in the vertical interval of a television signal

(i) Data echo rating

The data echo rating on any television channel employed to carry such signals within the vertical interval shall not exceed 4%.

(ii) Data delay inequality

The data delay inequality in any television channel employed to carry such signals in the vertical interval shall not exceed 50 ns.

3.1.13 Hum modulation of carriers in television channels

At any system outlet, the spurious modulation of any vision carrier at the frequency of the supply mains and harmonics thereof shall be such that the reference modulation to hum modulation ratio is not less than 46 dB.

When the reference modulation is a vision signal, its amplitude is that of the peak-to-peak composite signal, from peak white to sync tip.

3.1.14 Radiation from individual system components

The radiation from any individual component to be used in the system shall not exceed 1 x 10^{-10} W (-70 dBmW) within the operating frequency range of that system, when measured in accordance with pr EN 50083-2:1992 unless otherwise stated.

3.1.15 Immunity to external fields

(a) Immunity of complete system

The immunity of the system shall be such that at any system outlet on any distributed channel, the ratio of carrier to interfering signal (caused by an external field) shall be not less than the limits given for single-frequency interference in section 3.1.8 (a).

(b) Immunity of individual system components

The immunity of individual system components shall be such that, when measured in accordance with Clause 17 of IEC 728-1, the r.f. wanted to unwanted signal ratio is better than 64 dB for vision programmes and 50 dB for sound programmes.

3.1.16 Chrominance / luminance delay inequality

At any system outlet (see COPIF Chapter 14.2.4) on any television channel, the difference in transmission delay between luminance and chrominance information shall not exceed 170 ns. (FCC 76.605-a-11)

3.1.17 FM radio: additional performance requirements

(a) Amplitude response within an FM channel

The amplitude response as a function of frequency for the entire system shall be such that the maximum amplitude variation over any FM channel (bandwidth appropriate for the transmission system in use) is not more than 3 dB with the slope not exceeding 0.3 dB per 10 kHz within 75 kHz of the carrier.

(b) Adjacent channel spacing

The minimum spacing between adjacent unmodulated carriers shall be not less than 400 kHz for high fidelity transmission and not less than 300 kHz for other FM services.

(c) Relative level of adjacent carriers

The level difference between two carriers in the VHF band allocated to FM broadcasting shall not exceed 8 dB. The level difference between carriers on adjacent channels with less than 600 kHz spacing shall not exceed 6 dB.

(d) Regulation of power supplies

The outputs of the power supplies for the amplifiers shall be regulated or stabilised such that a variation of 10% of the main supply shall not change the system performance characteristics.

3.2 Standards Related to Broadband Coaxial Cable System

This section describes some of the applicable standards related to Broadband Coaxial Cable System.

3.2.1 Description of Some Standard Development By The SCTE For Broadband Coaxial Cable System

The Society of Cable Telecommunications Engineers Inc ("SCTE") is an accredited Standards Developing Organization of the American National Standards Institute ("ANSI") in the specialized area of broadband cable engineering. The following outline some of the standards available. For further details, please refer to the official publications from SCTE.

3.2.2 Interface Practices & In-Home Cabling Drop Specifications

(a) IPS-SP-001 Flexible RF Coaxial Drop Cable–This specification is intended to apply to general purpose flexible RF coaxial drop cable and not specialty cables. There are numerous reasons to standardize drop cable, but the primary reason is for proper cable to "F" fitting interface.

(b) IPS-SP-200 On Premises Bonding and Safety Specification–Electrical bonding refers to the methods and devices used to control or reduce voltages and currents imposed on the cable plant from foreign sources such as lightning and commercial AC power faults. The primary purpose of electrical bonding is to prevent damage to subscriber equipment and to prevent shock and injury to those involved in its construction, operation, and maintenance. The purpose of this practice is to stress the importance of providing a low resistance path to ground for both lightning and power protection.

(c) IPS-SP-202 Drop Amplifiers – The purpose of this specification is to specify recommended mechanical and electrical standards for broadband radio frequency ("RF") devices whose primary purpose is to amplify signals presented to an input port and deliver the amplified signals to one or more output ports. The devices are also required to pass signals in a different range of frequencies in the reverse direction and, optionally, may provide amplifications of such reverse signals. The specification's scope is limited to 75 Ω devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Devices covered by this specification include products commonly known as the Drop Amplifiers. They may be mounted with NID housing on dwellings or independently within dwellings.

(d) IPS-SP-206 Drop Passives: Splitters and Couplers – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency ("RF") devices whose primary purpose is to split signals presented to an input port among two or more output ports with a splitting ratio that is nominally independent of frequency. Alternatively, such devices can be used to combine signals from several input ports into a common output port. Its scope is limited to 75 Ω devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Products covered by this specification include signal splitters (2, 3, 4 and 8-way) and directional couplers.

(e) IPS-SP-207 Drop Passives: Antenna Selector Switches – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to allow signals presented to an input port to be routed selectively to one of two or more output ports. Alternatively, such devices can be used to select which among multiple input sources are routed to the common output port. Its scope is limited to 75Ω devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Products covered by this specification include switches commonly known as "A/B Switches" and "A/B/C Switches." These devices are regulated by the Federal Communications Commission as "Cable Input Selector Switches" under C.F.R. 47 ss 15 which are incorporated by reference into this standard.

(f) IPS-SP-208 Drop Passives: Bonding Blocks (Without Surge Protection) – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to provide a transition point between the network operator’s service cable (the "drop") and the distribution wiring within premises. An important function of the device is to provide a connection point for a bonding conductor in accordance with requirement of the National Electrical Code or local building requirements. The scope of this specification is limited to 75 Ω devices whose ports are provided with female type "F" connectors.

(g) IPS-SP-209 Drop Passives: Female F to Female F In-Line Adapters (F Splices) – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose purpose is to provide a transition between two type "F" Male connectors. The scope of this specification is limited to 75 Ω devices whose ports are provided with female type "F" connectors.

(h) IPS-SP-210 Drop Passives: FM Splitters – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to split signals presented to an input port such that signals in the FM broadband (88 MHz through 108 MHz) exit through one port and the remainder of the spectrum exits through other ports. Alternately, such devices can be used to combine signals in the FM band with signals in the remainder of the spectrum into a common output port. Its scope is limited to 75 Ω devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Two levels of compliance are specified. Those meeting electrical and mechanical but not environmental requirements may be designated as "indoor use" and the products must be marked as specified herein to guide users in their appropriate applications.

(i) IPS-SP-211 Drop Passives: Matching Transformers 75 Ω to 300 Ω – The purpose of this test is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to provide an impedance and connector match between 75 Ω coaxial type "F" and 300Ω twin-lead open screw connectorised devices. The most common use for such devices is matching coaxial cables from distribution system to screw antenna terminals on receivers. The alternative configuration provides a match between 300Ω twin lead (typically from off-air antennas) and type "F" receiver input ports.

(j) IPS-SP-212 Drop Passives: Power Inserters – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to multiplex AC power with RF signals carried over flexible drop cables. Alternatively, such devices can be used to extract power from cables which carry both RF and power voltages. The device also acts to block the power voltage from travelling both directions along the coaxial cable. The specification’s scope is limited to 75 Ω devices whose ports are provided with "F" connectors for at least the RF ports. The most common application for such devices is on-premises RF signal distribution. Two levels of compliance are specified. Those meeting the electrical and mechanical but not environmental requirements may be designated with "indoor use" and the products must be marked as specified herein to guide users in their appropriate application.

(k) IPS-SP-213 Drop Passives: In-Line Attenuators – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to provide a fixed attenuation of RF signals by an amount that is nominally independent of frequency. Its scope is limited to 75 Ω devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Two levels of compliance are specified. Those meeting electrical and mechanical but not environmental requirements may be designated with "indoor use" and the products must be marked as specified herein to guide users in their appropriate application.

(l) IPS-SP-214 MDU Amplifiers – The purpose of this specification is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to amplify signals presented to an input port and deliver the amplified signals to one or more output ports. The devices are also required to pass signals in a different range of frequencies in the reverse direction and, optionally, may provide amplification of such reverse signals. The specification’s scope is limited to 75Ω devices whose RF connectors may be "F" connectors or 5/8-24 mainline cable ports. The most common use of such devices is RF signal distribution in multi-dwelling units (“MDUs”). Devices covered by this specification include products commonly known as MDU Amplifiers.

(m) IPS-SP-215 Drop Passives: F Male Terminators – The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (“RF”) devices whose primary purpose is to provide a low reflection RF termination for 75Ω devices which are equipped with the "F" female ports which meet the requirements of SCTE IPS-SP-407.

3.2.3 On Premises Specifications

(a) IPS-SP-002 On Premise Cable Installation and Performance – The purpose of this document is to improve and standardize new dwelling pre-wiring and existing dwelling cable installation. This document is intended primarily for the cable industry to use as a standard to supplement procedures already in use. This document can be used by the local operator to distribute to home building industry crafts-people, home automation, electrical contractors and others that install coaxial cable for use with BCS signals. This will allow the local cable operator to provide BCS and future services to the home without having to rerun the coax in the house.

(b) IPS-SP-203 Passive Network Interface Devices (“NID”) Enclosure Specification – This specification is for NIDs intended to house internally, coaxial and telephony drop components. The primary purpose is to recommend a standard set of design requirements for mounting and enclosing drop components in outdoor applications.

(c) IPS-SP-204 Coaxial Cable System Customer Premise Interface – The intent of this specification is to provide necessary information on minimum requirements that may be used by interested parties for the protection of coaxial cable interface circuits. This specification is written for surge protection at customer entrance interface/demarcation points.

(d) IPS-SP-205 Active Network Interface Devices (“NID”) – This specification is for Network Interface Devices (“NID”) enclosures intended to house internally, broadband active drop components. The primary purpose is to recommend a standard set of design requirements for mounting and enclosing active drop components for outdoor applications. The functions of NID include physical connection point between drop loop and subscriber’s wiring, bonding point, test point, and weather-able housing.

3.2.4 F" Connector Specifications

(a) IPS-SP-400 "F" Port (Female Outdoor) Physical Dimensions–Mechanical dimensions for the female "F" connector, outdoor. ANSI/SCTE.

(b) IPS-SP-401 "F" Port (Male Outdoor) Physical Dimensions – Mechanical dimensions for the male "F" connector. This document does not cover the connector to cable interface.

(c) IPS-SP-402 Recommended "F" Push-On (Feed Thru, Male) – Mechanical dimensions for the male push-on "F" connector. This document does not cover the connector to cable interface.

(d) IPS-SP-404 Indoor F-Male Connector Installation & Performance – This document is the preliminary specification for the male and female connections used in In-Home cabling applications. The primary purpose is to recommend "F" connector practices pertaining to indoor usage. To this end, the document references existing practices and specifications from organisations such as

NEC, SCTE, and UL. This specification is meant to recommend a connection system that is compatible with general purpose indoor flexible RF coaxial drop cable and with other components specified by SCTE Interface Practices/In-Home Cabling Subcommittee.

(e) IPS-SP-405 Outdoor F-Male Connector Installation and Performance – The intent of this specification is to provide installation guidelines pertaining to the outdoor use of "F" Connectors and their attachment to both female "F" ports and 75 Ω coaxial cables ranging from 59-Series standard braid through 11-Series quadbraid. This specification is meant to recommend a connection system that is compatible with general purpose flexible RF coaxial drop cable and with other passive and active components used in the coaxial outdoor distribution network.

(f) IPS-SP-406 "F" Port (Female, Indoor) Physical Dimensions – Mechanical dimensions for the female "F" connector, indoor. ANSI/SCTE.

(g) IPS-SP-407 "F" Port Female Specifications – The purpose of this document is to specify torque, cantilever, axial strength and signal performance requirements for female "F" ports for both indoor and outdoor applications.

(h) IPS-SP-408 Male F Ports – The purpose of this document is to specify requirements for male "F" equipment ports for both indoor and outdoor applications. This specification does not cover connectors intended for installation on cables, whether of the "pin" type or the "feed-through" type.

(i) IPS-SP-600 Trap "F" Male Connector – Mechanical dimensions for the male "F" Connector portion of in-line traps.

3.2.5 Mainline Specifications

(a) IPS-SP-100 Specification for Trunk, Feeder and Distribution Coaxial Cable – This specification is intended to apply to general purpose semi-rigid RF coaxial cable, not specialty cables.

(b) IPS-SP-500 Recommended 5/8 – 24 Port (Female) – Mechanical dimensions for the female 5/8 – 24 entry port.

(c) IPS-SP-501 Recommended 5/8 – 24 Port (Male) – Mechanical dimensions for the male 5/8– 24 port plug.

(d) IPS-SP-502 Recommended Mainline Plug (Male) to Cable Interface – The primary purpose of this specification is to ensure acceptable electrical and mechanical performance integrity between cable and connector interfaces. The scope of this standard will be directed to the key performance of impedance, low galvanic action, low loop resistance, maximum cable retention, minimum inter-modulation distortion and AC hum, signal response, RF shielding, and water tight seals.

3.2.6 Test Procedure Documents

(a) IPS-TP-001 Cold Bend – The purpose of this procedure is to provide instructions to measure the cold bend properties of flexible RF coaxial drop cable.

(b) IPS-TP-002 Flexible Coaxial Cable Impact Test – This test is to establish that specified flexible RF coaxial drop cables are capable of withstanding an impact at low temperatures.

(c) IPS-TP-003 Polyethylene Jacket Longitudinal Shrinkage – The purpose of this test is to determine the amount of shrinkage of the jacketing material used on flexible RF coaxial drop cables.

(d) IPS-TP-004 Insertion Force – This test procedure is designed to measure the amount of linear force required to install a drop ("F") connector onto a drop cable of the proper size.

(e) IPS-TP-005 Centre Conductor Bond to Dielectric Bond – This test is to determine the amount of bond between the centre conductor and dielectric for specified flexible RF coaxial drop cables.

(f) IPS-TP-006 Coaxial Cable Impedance – The purpose of this procedure is to provide a test procedure for measuring the impedance of BCS coaxial cable using the Hewlett-Packard HP 8444A Tracking Generator, HP 8568B Spectrum Analyser, Wide Band Engineering ("WBE") A56 Return Loss Bridge, and WBE A65 low loss impedance transformers.

(g) IPS-TP-007 Coaxial Cable Structural Return Loss – The purpose of this procedure is to provide instructions to measure the Structural Return Loss ("SRL") characteristics of flexible RF coaxial drop cable from 5 MHz to 1,000 MHz. SRL is a ratio between the reflected and the reference signals or the reflection coefficient (Þ). ANSI/SCTE.

(h) IPS-TP-008 DC Loop Resistance – This method is intended for use in determining the DC Loop Resistance of coaxial cables using the Wheatstone Bridge Method.

(i) IPS-TP-009 Coaxial Cable Attenuation – Measurement technique for determining attenuation of coaxial cable at various frequencies.

(j) IPS-TP-010 Ampacity – This method is intended for use in determining the current carrying capacity (i.e., ampere capacity) of coaxial drop cables.

(k) IPS-TP-011 Transfer Impedance – This procedure is for the measurement of transfer impedance of coaxial drop cables from 5 MHz to 1,000 MHz.

(l) IPS-TP-012 Dielectric Withstand – This test procedure describes a method to determine if the dielectric used in flexible RF coaxial drop cables will withstand an alternating voltage for a preset time limit.

(m) IPS-TP-013 Interface Moisture Migration – This test method can be used for comparing the various methods used in sealing the interface by an artificial environment which cannot be correlated to field service, and for detecting moisture leakage of the "F" connector Interface. Liquid penetrate examination can be used to indicate the presence, location, and to an extent, the nature and magnitude of the detected moisture paths. This test method is intended primarily for localised areas of examination utilising minimal equipment. This method can also be used to determine the liquid tightness of integral or external seals, encapsulations or other environmental protection devices of the interface.

(n) IPS-TP-014 Aerial Cable Corrosion Protection Flow – This test is to determine that moisture blocking materials used in cables intended for indoor and aerial applications do not flow or drip out of the cable.

(o) IPS-TP-015 Diameter of Drop Cable – The purpose of this procedure is to determine one or more of the following characteristics relating to flexible coaxial drop cables. · Cable jacket outside diameter. Average core diameter over foil. ·Centre conductor diameter. Percentage of braid coverage. This method is intended to make use of relatively inexpensive equipment. For a more precise method using laser micrometers and the like see IPS-TP-018.

(p) IPS-TP-016 Jacket Web Separation – The purpose of this procedure is to provide the best methodology for separating messenger from messenger cable, with intent to ensure the validity of the measured data and that the data falls within specified requirements as dictated by this procedure.

(q) IPS-TP-017 Moisture Inhibitor Corrosion Resistance – This is to test the corrosion resistance of flooded drop cable.

(r) IPS-TP-018 Measuring Diameter Over Core – To document sample preparation, sample testing, and test procedure for off-line measurement of diameter over tape and ovality over tape of messenger cables.

(s) IPS-TP-102 Centre Conductor Bond to Dielectric for Trunk, Feeder and Distribution Coaxial Cables – This test is to determine the bond strength between the centre conductor and dielectric for specified semi-flexible cables.

(t) IPS-TP-103 Air Leakage Test Method for Trunk, Feeder, and Distribution Coaxial Cable – The purpose of this test is to detect voids in the dielectric (if applicable) and voids between the centre conductor and dielectric.

(u) IPS-TP-108 Static Minimum Bending Radius for Coaxial Trunk, Feeder and Distribution Cables – This test procedure is to be used for initially establishing or alternatively verifying the minimum static bend radius for coaxial distribution cable products. This procedure establishes the methodology to be used in the determination of a minimum bend radius as well as establishing a acceptance criteria by which products can be tested or compared.

(v) IPS-TP-110 Test Method for "Mainline" Pin (Plug) Connector Return Loss – The purpose of this procedure is to provide instruction to measure the return loss characteristics of a single Mainline Pin (Plug) Connector to cable interface, at the end of the cable, from 5MHz to 1 GHz. This test method applies to SCTE specifications IPS-SP-501 and IPS-SP-502. It implements the time domain gating feature of the network analyser which removes the near end interface, and termination from the far end connector (Device Under Test).

(w) IPS-TP-111 Test Method for "Mainline" Splice Connector Return Loss – The purpose of this procedure is to provide instruction to measure the return loss characteristics of a single Mainline Splice Connector interface between 2 mainline cables, from 5 MHz to 1 GHz. This test method applies to SCTE specifications IPS-SP-501 and IPS-SP-502. It implements the time domain gating feature of the network analysers which removes the near end interface, and far ends termination from Splice connector (“DUT”).

(x) IPS-TP-201 Insertion Gain/Loss, Frequency Response and Bandwidth – The purpose of this test is to determine the insertion gain or loss (as appropriate) as a function of frequency of a properly terminated device, as measured across the frequency range of interest. Depending on use of the data minimum and maximum gain or loss, response variation and/or bandwidth can be derived. Components exhibiting high loss characteristics (isolation) may be more accurately measured using IPS-TP-203.

(y) IPS-TP-202 Return Loss – The purpose of this test is to determine the precision of the impedance match provided at a given port of the component being evaluated, as measured across the frequency range of interest.

(z) IPS-TP-203 Isolation – The purpose of this test is to determine the degree of signal isolation provided by the component being evaluated, as measured across the frequency range of interest.

(aa) IPS-TP-204 Hum Modulation – The purpose of this test is to determine the degree of amplitude modulation at power-line-related frequencies added to a transmitted signal by the component being evaluated. The numeric result of the test is consistent with the definition used by the FCC [C.F.R. 47, §76.605(a)(11)] in its performance standards as applied to cable television systems, i.e., The peak-to-peak variation in signal level caused by modulation expressed as a percentage of the un-modulated carrier signal level (the level measured during the synchronising pulse for NTSC television signals). This numerical value is double the conventional definition of amplitude modulation in which 100% modulation results in the minimum carrier level just reaching zero.

(bb) IPS-TP-205 Test Method for Noise Figure – The purpose of this test is to determine the noise figure of a properly terminated amplifier device, as measured across the frequency range of interest. This specification is applicable to testing of 75 Ω components which are equipped with type "F" connectors.

(cc) IPS-TP-206 Composite Triple Beat Distortion – The purpose of this test is to determine the degree of composite third order (triple beat) distortion caused by passing a spectrum of carriers through the component being evaluated, as measured on the most-affected carrier.

(dd) IPS-TP-207 Composite Second Order Distortion – The purpose of this test is to determine the degree of composite second order (“CSO”) distortion caused by passing a spectrum of carriers through the component being evaluated, as measured on the most-affected carrier.

(ee) IPS-TP-208 Cross Modulation Distortion – The purpose of this test is to determine the degree of cross modulation (X-mod) distortion caused by passing a spectrum of carriers through the component being evaluated, as measured on the most affected carrier.

(ff) IPS-TP-209 Test Method for Power Consumption – The purpose of this test is to determine rate of consumption of 60 Hz energy by AC line powered devices.

(gg) IPS-TP-210 Coaxial Cable System Customer Premise Protection – This document covers the test procedures for the evaluation for the surge protectors used for coaxial cable systems at the customer premise. This document is to be used in conjunction with the SCTE specification IPS-SP-204.

(hh) IPS-TP-211 Test Method for Group Delay – The purpose of this test is to determine the group delay of a properly terminated device, as measured across the frequency range of interest. This specification is applicable to testing of 75 Ω components which are equipped with the type "F" connectors.

(ii) IPS-TP-215 Test Method for Torque Requirements for Ground Wire Penetration of Bonding Set Screw – This test procedure is to determine the mechanical force needed to penetrate ground wire to the appropriate depth. Ground wire penetration shall be less than 25% of wire outer diameter.

(jj) IPS-TP-400 Withstand Tightening Torque – To determine the strength required per IPSSP-401 (through torque) that will cause one or more of the following conditions to occur to the male interface. Stripping of the internal threads. · Breakage of the male interface. Failure of the nut hex-flats.

(kk) IPS-TP-401 Axial Pull Connector/Cable – To determine the tensile pull required to cause one or more of the following conditions in a cable/connector test system: Catastrophic cable structural failure. Connector structural failure. Separation due to slip at the cable/connector interface.

(ll) IPS-TP-402 Push-On Insertion Force – This document describes the test method for determining the axial installation force to install the indoor push-on connector onto the "F" female plug (port). This method is intended to allow for manufacturer’s freedom of design yet control the effort to install the connector. Every push-on connector has a different method for installing based on individuality of design. This document intends to encompass a wide variety of such designs, being flexible in some sections and standard in others.

(mm) IPS-TP-403 Shielding Effectiveness (GTEM Method for RF Signal) – This test procedure measures the shielding effectiveness (“SE”), in dB, of cables, connectors, and small devices such as splitters and traps commonly used in the BCS environment, using the technology known as the GTEM (Giga Hertz Transverse Electromagnetic Mode) cell.

(nn) IPS-TP-404 Axial Load Temperature Cycling – This test procedure is intended to evaluate the connection between the connector and the coaxial cable when it is subjected to a continuously varying environmental cycle. The installed connectors have an axial load of 15 pounds applied to them during the environmental cycling.

(oo) IPS-TP-405 DC Contact Resistance – This test procedure is intended to evaluated the DC contact resistance between the connector and the coaxial cable following exposure to a salt spray test per MIL-STD-202F, method 101D.

(pp) IPS-TP-406 Salt Spray – This test procedure is intended to evaluate the plating of connectors and the coaxial cable following exposure to a salt spray test per ASTM B 368.

(qq) IPS-TP-407 “F” Connector Return Loss – The purpose of this procedure is to provide instructions to measure the return loss characteristics of a single type "F" connector-to-cable interface, at the beginning of a cable, from 5 MHz to 1,000 MHz. This test method applies to SCTE specifications IPS-SP-402, IPS-SP-403, and IPS-SP-404. This test method makes use of the time domain gating feature of the network analyser to remove the far end connector effects from the near end connector under test. ANSI/SCTE.

(rr) IPS-TP-408 “F” Connector Return Loss In-line Pair – The purpose of this procedure is to provide instructions to measure the return loss characteristics of a pair of type "F" connectors and the cable interface, inserted in the middle of a cable, from 5 MHz to 1,000 MHz. This test method applies to SCTE specifications IPSSP-402, IPS-SP-403, and IPS-SP-404. This test method makes use of the time domain gating feature of the network analyzer to remove the near end and far end test set connector effects from type "F pair" in the middle of the cable, joined by a type F(f) - type F(f) adapter.

(ss) IPS-TP-409 Common Path and Inter-modulation Distortion – The intent of this test procedure specification is to provide a means of measuring the coaxial interface that becomes non-linear to the path of radio frequencies.

(tt) IPS-TP-500 Core Depth Verification – The purpose of this test method is to determine the cored depth of semi-flex aluminium sheath cable. The core depth is the internal measured distance between the dielectric foam and the square-cut end of the outer aluminium sheath. This test method will define the suggested method for core depth measurement.

(uu) IPS-TP-700 Hex Crimp Tool Verification/Calibration – This test method is used to determine and verify the actual crimp dimension of hex crimp tools. It also provides a measurement technique for determining the final hex size that may affect pull-off performance of the cable-to-connector interface. A calibration technique for adjusting hex crimp tools is also specified.

3.3 Methods Of Measurements For Broadband Coaxial Cable System

3.3.1 General

The basic methods of measurements shall be conducted in accordance with the recommendations both IEC 728-1 and National Cable Television Association ("NCTA"). Any equivalent method that ensures the same accuracy may be used for assessing performance.

The following measurements are considered:

(a) Measurement of mutual isolation between system outlets;

(b) Measurement of hum;

(c) Measurement of amplitude/frequency response within a channel;

(d) Measurement of visual, aural carrier centre frequency;

(e) Measurement of inter-modulation;

(f) Measurement of visual-carrier-to-noise ratio;

(g) Measurement of chrominance – luminance delay inequality;

(h) Measurement of differential gain and phase; and

(i) Measurement of signal leakage.

3.3.2 Measurement of mutual isolation between system outlets

(a) References to system outlets shall also apply to the far ends of subscribers' feeders when no system outlets are used.

Isolation shall be measured between:

(i) System outlets connected to adjacent subscriber's taps; and

(ii) System outlets connected to the same multiple subscribers' taps.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of IEC 728-1.

3.3.3 Measurement of hum

(a) Modulation distortion at power frequencies (i.e., hum) is the amplitude distortion of the desired signals caused by the modulation of these signals with components of the power source.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(10) and NCTA Recommended Practices – Second Edition 1993.

3.3.4 Measurement of frequency response within a channel

(a) Frequency response is a measure of the overall gain variation of a cable system as a function of frequency. It is normally measured in dB peak to peak (sometimes called peak-to-valley) or as ± dB (half the peak-to-peak value).

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(6) and NCTA Recommended Practices – Second Edition 1993.

3.3.5 Measurement of visual, aural carrier centre frequency

(a) Vision carrier level in a cable television system is the r.m.s. voltage of a channel's visual (picture) carrier measured across a termination impedance which matches the internal impedance of the cable system. Aural carrier level in a cable television system is the r.m.s. voltage of a channel's aural (sound) carrier measured across a termination impedance which match the internal impedance of the cable system, generally expressed with reference to the channel's associated visual carrier level.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(4) and NCTA Recommended Practices – Second Edition 1993.

3.3.6 Measurement of inter-modulation

(a) The method is applicable to measurements of single inter-modulation products, second-order inter-modulation products and third-order inter-modulation products.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of IEC 728-1 Clause 9 and NCTA Recommended Practices – Second Edition 1993.

3.3.7 Measurement of visual carrier-to-noise ratio

(a) Vision carrier to noise ratio is the power in a sinusoidal signal, whose peak is equal to the peak of a visual carrier during the transmission of synchronising pulse, divided by the associated system noise power in the 5 megahertz bandwidth. This ratio is expressed in dB.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(7) and NCTA Recommended Practices – Second Edition 1993.

3.3.8 Measurement of chrominance – luminance delay inequality

(a) The chrominance – luminance delay inequality caused by a headend system or component is defined as the change in delay time of the chrominance component of the signal relative to the luminance component after passing through the system. The parameter is also called chroma delay.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(11)(i) and NCTA Recommended Practices – Second Edition 1993.

3.3.9 Measurement of differential gain and phase

(a) The methods are applicable to the measurement of differential gain and differential phase for complete systems and items of equipment thereof.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(11)(ii)(iii) and NCTA Recommended Practices – Second Edition 1993.

3.3.10 Measurement of signal leakage

(a) The term “leakage” refers to the undesired emanation of electromagnetic energy from the cable television system.

(b) Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(12) and NCTA Recommended Practices – Second Edition 1993.

3.4. Typical Broadband Coaxial Cable System Schematic Diagram for Strata-Landed Dwelling Houses and Multi-Storey Residential Buildings

Typical broadband coaxial cable system schematic diagram for strata-landed dwelling houses and multi-storey residential buildings