

Reference

External Telephone Color Code

Pair	Line +	Line -	Binder-tape colors:
1	White	Blue	Pairs 1-10 - Blue binder
2	White	Orange	Pairs 11-20 - Orange binder
3	White	Green	Pairs 21-30 - Green binder
4	White	Brown	Pairs 31-40 - Brown binder
5	White	Slate	Pairs 41-50 - Slate binder
6	Red	Blue	Pairs 51-60 - Blue/White binder
7	Red	Orange	Pairs 61-70 - Blue/Orange binder
8	Red	Green	Pairs 71-80 - Blue/Green binder
9	Red	Brown	Pairs 81-90 - Blue/Brown binder
10	Red	Slate	Pairs 91-100 - Blue/Slate binder

Internal Cabling Color Coding and Pair Assignment

	Pair	Line +	Line -
Flat Modular Cordage	1	Green	Red
	2	Black	Yellow
	3	White	Blue
6P6C RJ12 Pin	1	3	4
	2	5	2
	3	1	6
Cat-5E & Cat-6 Color Code	1	White/Blue	Blue
	2	White/Orange	Orange
	3	White/Green	Green
	4	White/Brown	Brown
8P8C RJ45 PIN	1	5	4
	2	3	6
	3	1	2
	4	7	8

Internal Telephone Cable Color Code

Pair numbering commences at outer layer

Pair	Line +	Line -
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown
5	White	Slate
6	White	Blue/White
7	White	Blue/Orange
8	White	Blue/Green
9	White	Blue/Brown
10	White	Blue/Slate
11	White	Orange/White
12	White	Orange/Green
13	White	Orange/Brown
14	White	Orange/Slate
15	White	Green/White
16	White	Green/Brown
17	White	Green/Slate
18	White	Brown/White
19	White	Brown/Slate
20	White	Slate/White
21-40	Yellow	Repeat Sequence
41-60	Black	Repeat Sequence
61-80	Violet	Repeat Sequence
81-100	Red	Repeat Sequence

Telstra Facility Cable Color Coding

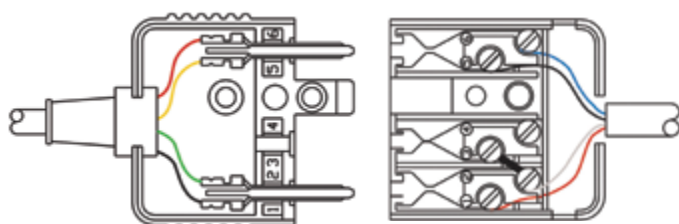
Pair	Tip (L+)	Ring (L-)
1	White	Blue
2	Red	Black
3	Orange	Green

Category-5E Color Sequence

Category-5E cabling utilises a standard conductor color coding system. Each pair of conductors consists of a white conductor and a colored conductor. Each white conductor is usually marked with a colored stripe or band to prevent incorrect pairing.

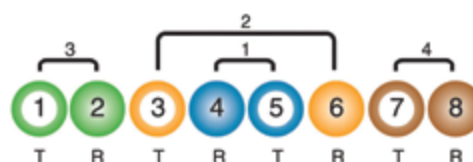
Pair	Color
1	White/Blue
2	White/Orange
3	White/Green
4	White/Brown

605 Plug / 610 Socket Color Sequence



Two different pair sequences are used for terminating pairs in a Category 5 or 5E cabling system. Each pair consists of 2 conductors known as the Tip and Ring. The tip (or L+) conductor is always white and the ring (L-) conductor is colored. Each pair of conductors is assigned a pair of pins in the modular jack according to one of the following standard sequences. The preferred pair assignment for use in Australia is identified as T568A, although T568B is also used.

T568A (Preferred Australian System)



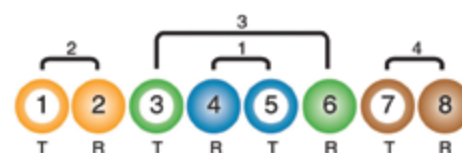
Telephone Line Test Numbers

All test numbers for Telstra begin with 12722. All test numbers for Optus begin with 12723. There are a few test numbers used by both carriers.

Common Test Numbers

Test Number	Service
12711	Long distance carrier pre-selection confirmation
1800 80 1920	Own number RVA

T568B (AT&T)



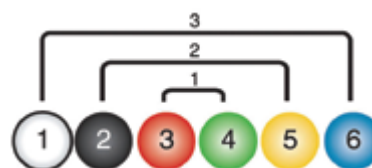
Telstra Test Numbers

Test Number	Service
12722 0	CND send status
12722 123	Own number RVA
12722 199	Ringback
12722 40008	Network test message

Optus Test Numbers

Test Number	Service
12723 12	Own number RVA
12723 22	1Khz tone
12723 99	Ringback

Flat Voice Cord Color Sequence (USOC)

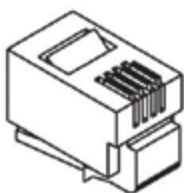


Modular Plug/Jack Types

There are several modular jack sizes and variations.

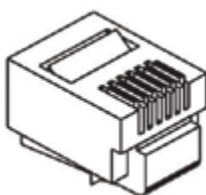
4 Position

The 4 position (4P4C) is narrower than the 6 position modular plug and usually only used on coiled telephone handset cords although occasionally used for other applications.



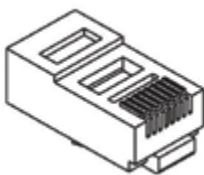
6 Position

The 6 position modular plug is most commonly used for line cords in voice applications and is often referred to as RJ11 or RJ12. The 6 position poly-carbonate body can be loaded with only the centre 2 or 4 gold contacts or can be fully loaded with all 6 contacts. For basic 2 wire voice applications, the centre 2 contacts are used and the plug should be correctly described as 6P2C (6 position, 2 contact). Where 4 wires are required for Key Telephone Stations or two lines etc., the centre 4 contacts are used and the plug should be correctly described as 6P4C. In applications which require 6 wires all contacts are loaded and the plug is called 6P6C.



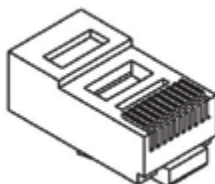
8 Position

The 8 position modular plug is now becoming the standard for data and voice applications. This jack is usually referred to as RJ45. The plug body is usually supplied with all 8 gold contacts loaded is should be correctly referred to as 8P8C. For basic voice line cords the plug may be loaded with only the centre 2 or 4 gold contacts and referred to as either an 8P2C or 8P4C. For data applications, several color coding sequences are used for the conductor pairs. In Australia, the most widely used system is known as T568A.



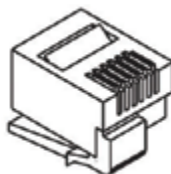
10 position

The 10 position (10P10C) modular plug is has same width body as the 8 position but has an extra contact added on each side.



MMP

The MMP - Modified Modular Plug is a proprietary variation of the 6 position plug which was developed by Digital Equipment Corporation (DEC). The MMP plug has the latch shifted from the centre to one side to avoid the possibility of interchanging DEC data wiring and a normal telephone line plug. MMP is also referred to as DEC-Connect or MMJ. An 8 position keyed modular plug is also available but is not commonly used in Australia.



NOTE

We recommend adoption of 8P8C, 6P4C terminology when describing modular plugs and jacks. This is a definite way to avoid confusion between similar plugs.

The codes RJ11, RJ12, RJ45 and other RJ (Registered Jack) numbers actually specify various wiring configurations used in the USA, not actual Plug or Jack types.

Modular Plug Variations

Round or Flat Cord Entry

2 variations of modular plug exist to accommodate either Flat or Round cord. The lower face of the cord entry on the rear of the plug body can be either Flat or Round.

The round type should always be used when terminating Category 5 or other Round cords to ensure that the jacket and conductors are not crushed during termination. Flat cord plugs must be used to ensure adequate cord strain relief of flat cord.



Round



Flat

Contacts for Solid or Stranded Conductors

The IDC (Insulation Displacement Contact) section of the Gold contacts can be designed for either Solid conductors or Stranded conductors. Plugs for solid wires have a 3 pronged contact which forks over the Solid conductor whilst the contacts for stranded conductors have 2 spikes which penetrate between the strands. Failure to use to correct contact type will result in unreliable terminations.

Solid Conductor Contact



Solid

Stranded Conductor Contact



Stranded

Modular Plug Termination Recommendations

- Always use a modular plug with the correct contacts for stranded conductors or solid conductors.
- Do not terminate flat cord plugs onto round cord & vice versa.
- Avoid plugging 6 position plugs into 8 position sockets where possible.
- Use quality tools for crimping modular plugs.
- Avoid RJ11, RJ45 Terminology to avoid confusion.
- Ensure plugs with suitable grade of gold plating are used.
- Avoid excessive bending or squashing of data cable jackets.
- Use plug boots to provide extra strain relief.

Modular Plug Gold Plating

The contacts used in modular plugs are gold plated and the gold plating thickness affects the electrical characteristics of the contact and its resistance to corrosion. The thickness of the Gold Plating is usually measured in μ " (Microinches) or sometimes in microns.

Thickness of Contact Gold Plating

Microinch	Microns	Comments
6 μ "	0.15 μ m	Not recommended. Sometimes used on poor quality or unapproved telephones.
15 μ "	0.38 μ m	The minimum quality for satisfactory voice connections. Unsuitable for data.
30 μ "	0.76 μ m	Satisfactory for voice connections and low speed data only.
50 μ "	1.27 μ m	Provide reliable voice & data connection (when terminated correctly).

Straight-thru and Cross-over Cords

Modular Cords

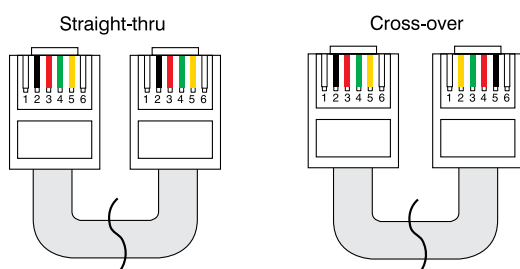
Flat modular cords can be wired in either straight-thru or cross-over configuration. Cross-over wiring is most commonly used for connection of equipment such as telephones, modems, faxes and terminals to a modular wall outlet. However, voice applications will usually tolerate either configuration. Data equipment may use either straight-thru or cross-over depending on the equipment's specifications. Accessories such as couplers and double adaptors are available in straight-thru or cross-over models.

Flat Modular Cord Wiring Configurations

Straight-thru Polarity		Cross-over Polarity	
End A	End B	End A	End B
Pin 1	Pin 1	Pin 1	Pin 8
Pin 2	Pin 2	Pin 2	Pin 7
Pin 3	Pin 3	Pin 3	Pin 6
Pin 4	Pin 4	Pin 4	Pin 5
Pin 5	Pin 5	Pin 5	Pin 4
Pin 6	Pin 6	Pin 6	Pin 3
Pin 7	Pin 7	Pin 7	Pin 2
Pin 8	Pin 8	Pin 8	Pin 1

Checking Flat Modular Cord Wiring Polarity.

Hold both ends of the modular cord with the plugs alongside each other. Ensure that the gold contacts of both plugs are facing you and the cord from each plug is leading down. The gold contacts are numbered from left to right with the plugs in this orientation. Compare the color sequence from left to right. If the colors appear in the same sequence on both plugs, the cord is wired straight-thru. If the color sequence is reversed on the second plug, the cord is wired cross-over.



Patch Cords

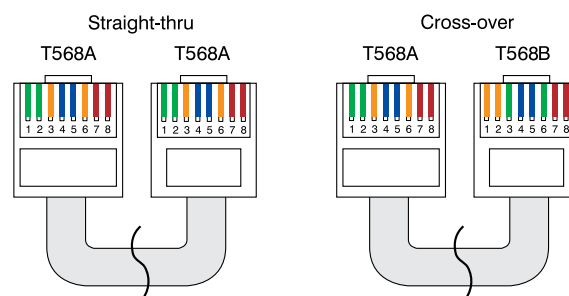
The majority of patch cords used for connections between jacks on a patch panel or from a PC or terminal to a wall outlet are wired straight-thru in T568A to T568A configuration. Cross-over cords are used to daisy-chain switches/hubs or for direct connection of 2 computer network interface cards. Cross-over cord wiring is T568A to T568B with the wiring of the green and orange pairs being transposed.

Category 5E & 6 Modular Cord Wiring Configurations

Straight-thru Polarity		Cross-over Polarity	
End A	End B	End A	End B
Pin 1	Pin 1	Pin 1	Pin 3
Pin 2	Pin 2	Pin 2	Pin 6
Pin 3	Pin 3	Pin 3	Pin 1
Pin 4	Pin 4	Pin 4	Pin 4
Pin 5	Pin 5	Pin 5	Pin 5
Pin 6	Pin 6	Pin 6	Pin 2
Pin 7	Pin 7	Pin 7	Pin 7
Pin 8	Pin 8	Pin 8	Pin 8

Checking Category 5E & 6 Modular Cord Wiring Polarity

Hold both ends of the modular cord with the plugs alongside each other. Ensure that the gold contacts of both plugs are facing you and the cord from each plug is leading down. The gold contacts are numbered from left to right with the plugs in this orientation. Compare the color sequence from left to right. If the colors appear in the same sequence on both plugs, the cord is wired straight-thru. If the color sequence of the green and orange pairs is transposed on the second plug, the cord is wired cross-over.



Cable Categories

Category	Frequency	Max Data Speed	Use
1&2	< 1MHz	56Kbps	Voice & low speed data only
3	16MHz	10Mbps	Voice & low speed LAN (10-Base-T, 4 Mbps Token Ring)
4	20MHz	16Mbps	Voice & moderate speed LAN
5	100MHz	100Mbps	Voice & high speed LAN
5e	125MHz	1000Mbps	Voice & high speed LAN
6	250MHz	>1000Mbps	Gigabit LAN
7	600MHz	>1000Mbps	Future applications

Australian Mains Plug Variations – AS/NZS3112

	10A 2 Pins	10A 3 Pins	10A 3 Pins (Round Earth)	15A 3 Pins	20A 3 Pins
Plug End Pinout					
Description	Standard 10A mains plug for double insulated appliances	Standard 10A mains plug	10A mains plug with round earth pin	Standard 15A mains plug	Standard 20A mains plug
Socket Compatibility					
10Amp Flat Earth	■	■			
10Amp Round Earth	■		■		
15Amp Flat Earth	■	■		■	
20Amp Flat Earth	■	■		■	■
Applications	Double insulated domestic appliances and equipment.	Earthed domestic appliances and equipment.	Special purpose outlets such as control circuits, lighting and exhaust fans etc.	Caravans, air conditioning, light industrial appliances and equipment.	Plug-in stoves air conditioning and light industrial appliances and equipment.
Active & Neutral Pins					
6.35mm x 1.63mm	■	■	■	■	
9.08mm x 1.63mm					■
Earth Pin					
6.35mm x 1.63mm	NA	■			
9.08mm x 1.63mm	NA			■	■
4.75mm diameter	N/A		■		

IEC-320 Appliance Connectors

Connector Type	Connector	Inlet	Max. temp.	Rated Current (Amps)
	C1	C2	70 °C	0.2A
	C3	C4	70 °C	2.5A
	C5	C6	70 °C	2.5A
	C7	C8	70 °C	2.5A
	C9	C10	70 °C	6.0A
	C11	C12	70 °C	10.0A
	C13	C14	70 °C	10.0A
	C15	C16	120 °C	10.0A
	C15A	C16A	155 °C	10.0A
	C17	C18	70 °C	16.0A
	C19	C20	70 °C	16.0A
	C21	C22	155 °C	16.0A
	C23	C24	70 °C	16.0A

Power Supply Units Abbreviations and Symbols

The rating plate of an Extra Low Voltage Power Supply Unit. (ELVPSU) shows various symbols and abbreviations representing ratings, class, insulation, polarity and other electrical safety and EMC compliance details.

Abbreviations

The following abbreviations used in conjunction with a numeric value, are used to define nominated electrical characteristics of a power supply unit.

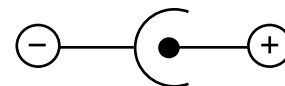
V	volts	Hz	hertz
A	amperes	PRI	input
mA	miliamperes	SEC	output
VA	volt amperes	DC	direct current
VAC	volts AC	AC	alternating current
W	watts	~	single phase (AC)

DC Adaptor Polarity Symbols

The polarity symbol on the rating plate of an AC to DC power supply indicates if the centre (or tip) of the output plug is positive (+) or negative (-). It is important to use a power supply having the correct polarity for the host device. Reverse polarity may result in malfunctioning or damaged equipment.

Centre Positive.

Indicates that the centre (tip) of the output plug is Positive (+) and the barrel of the output plug is Negative (-).



Centre Negative.

Indicates that the centre (tip) of the output plug is Negative (-) and the barrel of the output plug is Positive (+).



Other Symbols

These symbols are used to define the type of construction and safety and/or fail-safe characteristics of a power supply unit.

	Direct current		Protective earth		Class II construction
	Isolating transformer		Safety isolating transformer		Fail-safe transformer
	Fuse-link		Frame or core terminal		
	Non-short-circuit transformer.				Has an associated external protective device.
	Short-circuit-proof transformer.				There are two types. An inherent type is short-circuit proof provided that the temperature rise does not exceed the specified limit. A non-inherent type is equipped with an external protective device.
	Fail-safe transformer.				The non-short-circuit-proof transformer symbol or the short-circuit-proof transformer symbol can be combined with either an isolating transformer symbol or with a safety isolating transformer symbol to produce a composite symbol. In this example, the short-circuit-proof symbol is used in conjunction with the safety isolating transformer symbol.

Approvals, Permits and Compliance

ACA / Austel Compliance

The Australian Telecommunications Authority (Austel) were responsible for issuing cabling licences, equipment permits and monitoring the conduct of licence and permit holders for all equipment and components connected to the Australian telephone network. The Spectrum Management Agency (SMA) was the Australian Commonwealth statutory agency responsible for the management of radio-communications in Australia. On 1 July 1997, AUSTEL and SMA merged to form the Australian Communications Authority (ACA). The ACA is now responsible for technical regulation, consumer issues and licensing of telecommunications and radio-communications in Australia.

A-Tick

The A-tick and ACA supplier code indicates compliance with Australian telecommunications requirements and that the equipment can be legally connected to the Australian telecommunications network. Our ACA supplier code is N692.



C-Tick

C-Tick markings may also appear on products which are required to comply with Australian electromagnetic compatibility requirements and radio-communications standards and indicates that the product may be legally sold in Australia. Our ACA supplier code is N692



Since 31 December 1998, all equipment which requires EMC compliance must be marked with the C-tick and ACA supplier code number. The supplier is responsible for holding a compliance folder which contains compliant test reports and a declaration of conformity.

A-Cross

If an item covered by the Telecommunications Labelling Notice does not comply with the applicable standard(s) and it is not a permitted item, it is regarded as non-compliant.

All non-compliant items must be labelled with the A-Cross non-compliance symbol and the non-compliance notice shown below.

CAUTION

DO NOT USE BEFORE READING THE INSTRUCTIONS

Do not connect this customer equipment or customer cabling to a carrier or carriage service provider's telecommunications network or facility unless:

- (a) you have the written consent of the network or facility manager; or
- (b) the connection is in accordance with a connection permit or connection rules.

Connection of this customer equipment or customer cabling may cause a hazard or damage to the telecommunications network or facility, or persons, with consequential liability for substantial compensation.



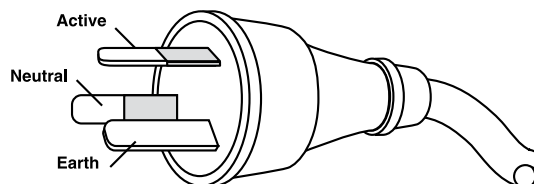
Electrical Safety Compliance & RCM

Power cords and AC adaptors for use in Australia must be tested for compliance with state electrical safety authority regulations. The New South Wales state government department responsible for electrical safety is the Department of Fair Trading (DOFT). Most other states also have a department responsible for issuing Electrical Safety Certificates. A safety certificate issued in any state is recognised Australia wide. The product must be marked with a valid Electrical Safety Certificate Number e.g. N13816 or a RCM number issued by Standards Australia (SAA) e.g. N5071. C-Tick markings may also appear on an AC adaptor and show compliance with EMC standards. The RCM (Regulatory Compliance Mark) may be used as an alternative to show compliance with Electrical Safety and EMC standards. Our RCM (SAA) number is N5071.



3-pin Australian Mains Plug

Use	Marking	Flex Conductor Colors	Building Wire Conductor Colors
Active	A	Brown	Red
Neutral	N	Blue	Black
Earth	E	Green/Yellow	Green/Yellow



Power Calculation

The following formula is used to calculate wattage (or VA). This formula is useful to determine if a required voltage and current combination will exceed the maximum capacity of a particular AC Adaptor's case.

$$\text{Volts} \times \text{Amps} = \text{Watts (VA)}$$

Tip and Ring

The names for the two wires of a telephone line were derived from the electrical contacts on the original 1/4 inch telephone plug. These plugs are similar in appearance to the 6.5mm diameter stereo phono plugs that are sometimes still used for stereo headsets. One electrical contact is at the tip of the plug (used for Line +) and the other is a ring just above it (used for Line -). There is also a third contact referred to as the sleeve.



DTMF - Dual Tone Multi Frequency

DTMF is the signalling method used for dialling by most modern telephones. A pair of frequencies is assigned to each of 12 dial buttons on the telephone. An additional column of DTMF tones (A, B, C & D) is also specified but is seldom used now. DTMF signalling is also sometimes referred to as Tone Dialling, VF Signalling, MF Dialling or Touch Tone. The "#" symbol is also known by many different names including Crosshatch, Hatch, Pound and Octothorpe.

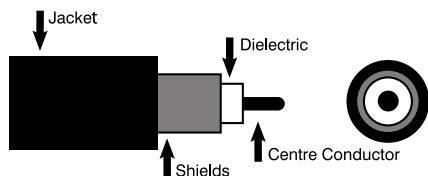
DTMF Frequency Matrix

		High Group Frequencies			
Hz		1209 Hz	1336 Hz	1477 Hz	1633 Hz
Low Group Frequencies	697 Hz	1	2	3	A
	770 Hz	4	5	6	B
	852 Hz	7	8	9	C
	941 Hz	*	0	#	D

Coaxial Cable

Coaxial cable (or "coax") is the most common cable used for transmitting video signals. The name "coaxial" refers to the common axis of the two conductors.

Construction



A coaxial cable has a solid copper or copper-clad-steel centre conductor surrounded by a non-conductive dielectric insulating material. The dielectric is surrounded by foil shield/s and/or copper braid/s which form the outer conductor and also shield against electromagnetic interference (EMI). The outer conductor/shield is encased in a PVC jacket.

Most coaxial cables for video applications have a nominal impedance of 75 ohms. Their differing electrical and physical characteristics make it important to select the correct type of cable to suit the application.

Types of coaxial cables

The three most commonly used coaxial cable types for video applications are RG59/U, RG6/U and RG11/U. The "RG" number originated from the "registration number" allocated by the US military to each type of cable. The "U" indicates that the dielectric is unbonded to the centre conductor.

RG59/U is available with either solid copper or copper-clad-steel centre conductor. It's suitable for basic analog TV antenna feeds in residential applications and for basic CCTV systems over short cable runs. The copper-clad-steel type has high tensile strength and should be used when terminating the cable with F-Type connectors.

RG6/U Dual-shield Used for security systems, for analog TV antenna cabling and for CCTV. It features a copper-clad-steel inner conductor. Tri-shield and quad-shield versions of RG6/U provide additional EMI shielding for digital applications.

RG6/U Quad-shield is the minimum requirement under the latest Australian Standard for digital TV antenna cabling and for all TV antenna cabling for apartments/units (MATV). It is also used for the distribution of Cable TV (CATV) and Satellite TV (SATV) in residential or commercial premises. It features a copper-clad-steel inner conductor. Dual-shield and tri-shield versions of RG6/U do not provide adequate EMI shielding for these applications.

RG11/U Quad-shield is used for the same applications as RG6/U for either backbone cabling or for long distribution runs. It features a copper-clad-steel inner conductor.



Coaxial Connectors

BNC connectors are bayonet type connectors, commonly used in CCTV systems. They are the most suitable connector for use with RG59/U cable.

F-Type connectors are used for CATV, SATV and Digital TV in conjunction with either RG6/U or RG11/U cables. The copper-clad-steel inner conductor of the cable forms the inner "pin" of the connector. Although "twist-on" type connectors are available, they do not produce a reliable connection in comparison to a crimp-type connector that has been terminated with a good-quality ratchet crimping tool.

PAL (Belling Lee) connectors are a push-on connector that has been traditionally used for TV antenna wall plates and connections. With the exception of TV/VCR hook-ups, PAL connectors are being replaced by F-Type connectors as required for CATV, SATV and DTV.

Adaptors. Where BNC connectors are required with RG6/U coaxial cable, it is recommended that an F-Type plug be crimped to the RG6/U and an F-Type to BNC adaptor used.



I.P. Rating

A three-digit number (as specified in Australian Standards AS1939 and EN60529) is used to provide an IP Rating to a piece of electronic equipment or to an enclosure for electronic equipment.

The three digits represent three different forms of environmental influence:

The **first digit** represents protection against ingress of solid objects.

The **second digit** represents protection against ingress of liquids.

The **third digit** represents protection against mechanical impact damage.

The third digit is often omitted, resulting in a 2-digit IP Rating covering ingress against solid objects and liquids only. As an example, our Gel Connectors are rated at IP67 (totally protected against dust ingress and withstands immersion up to a depth of 1 metre).

The larger the value of each digit, the greater the protection from the corresponding environmental influence. As an example, a product rated as IP573 would be better protected against environmental factors than another similar product that was only rated as IP432.

First Digit - Protection against ingress of solids

Value	Protection Offered
0	No protection
1	Protected against solid objects over 50mm e.g. hands, large tools.
2	Protected against solid objects over 12mm e.g. hands, large tools.
3	Protected against solid objects over 2.5mm. (wire, small tools etc).
4	Protected against solid objects over 1.0mm e.g. wires.
5	Limited protection against dust ingress (no harmful deposit)
6	Totally protected against dust ingress.

Second Digit - Protection against ingress of liquids

Value	Protection Offered
0	No protection
1	Protected against vertically falling drops of water.
2	Protected against direct sprays of water up to 15° from vertical.
3	Protected against direct sprays of water up to 60° from vertical.
4	Protected against water sprayed from any direction. Limited ingress permitted.
5	Protected against low pressure water jets from any direction. Limited ingress permitted.
6	Protected against high pressure water jets from any direction. Limited ingress permitted.
7	Protected against immersion between 15cm and 1Metre.
8	Protected against long periods of immersion under pressure.

Third Digit - Protection against mechanical impact damage

Value	Protection Offered
0	No protection
1	Protected against 0.225 joule impact (150g @ 15cm).
2	Protected against 0.375 joule impact (250g @ 15cm).
3	Protected against 0.5 joule impact (250g @ 20cm).
4	
5	Protected against 2.0 joule impact (500g @ 40cm).
6	
7	Protected against 6.0 joule impact (1.5Kg @ 40cm).
8	
9	Protected against 20 joule impact (5Kg @ 40cm).