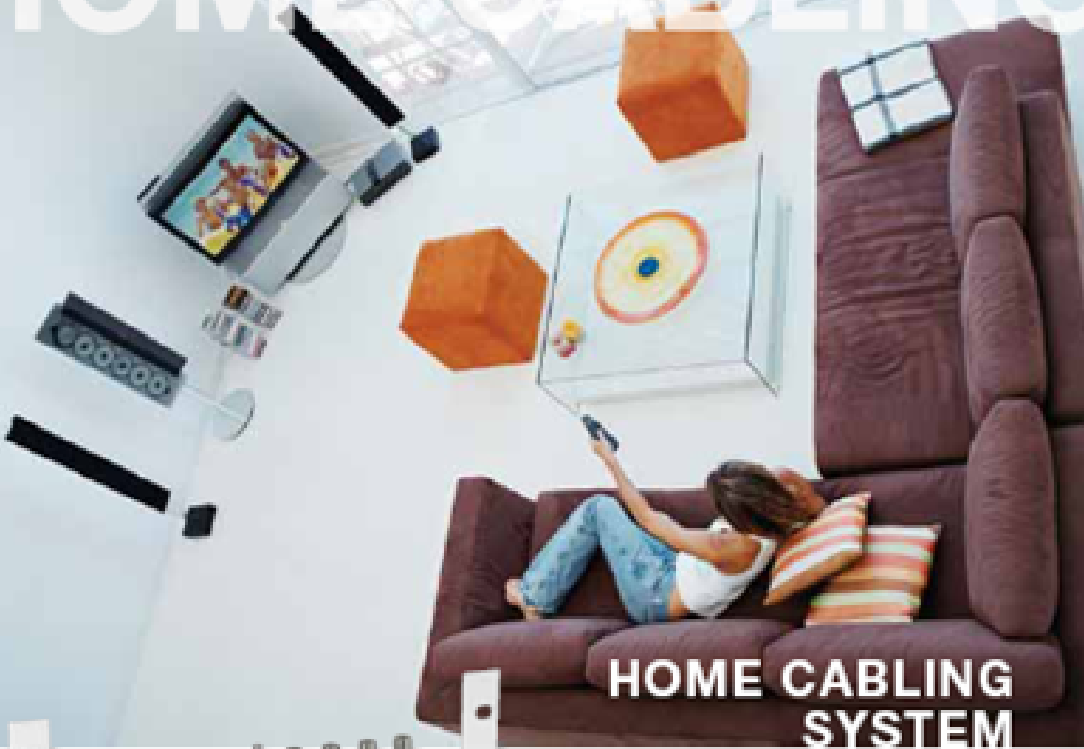


HOME CABLING



connectix
home 

Table of Contents

| | |
|---|-----------|
| HOME CABLING SYSTEMS INTRODUCTION | 4 |
| HOME CABLING APPLICATIONS..... | 4 |
| HOME CABLING – GENERAL THOUGHTS | 5 |
| <i>Home Cabling Application Considerations</i> | 5 |
| <i>Home Cabling System Detail Summary</i> | 7 |
| PLANNING A HOME CABLING SYSTEM..... | 8 |
| DESIGN STEPS | 8 |
| HOME CABLING SYSTEM: CABLING | 10 |
| LOCATION SPECIFIC CONNECTIONS | 10 |
| <i>Hall</i> | 10 |
| <i>Kitchen</i> | 10 |
| <i>Dining Room</i> | 10 |
| <i>Living / Family room</i> | 10 |
| <i>Other reception rooms / study</i> | 10 |
| <i>Garage</i> | 10 |
| <i>Bedrooms</i> | 10 |
| NON LOCATION SPECIFIC CONNECTIONS..... | 11 |
| <i>Telephone Service location</i> | 11 |
| <i>AV signal connection</i> | 11 |
| <i>Use of data devices for AV distribution</i> | 12 |
| <i>Proximity to power outlets</i> | 12 |
| <i>Broadcast signal reception – aerial connection</i> | 12 |
| OUTLET OPTIONS | 13 |
| <i>Outlets for Cat5e cabling</i> | 13 |
| <i>Outlets for RF TV/Radio signal distribution</i> | 14 |
| <i>Outlet back box specification</i> | 14 |
| CABLE ROUTE CONSIDERATIONS..... | 15 |
| HOME CABLING SYSTEM: CORE | 16 |
| HOME CABLING SYSTEM CABINET | 16 |
| CABINET LOCATION..... | 16 |
| CABINET COMPONENT SPECIFICATION | 17 |
| <i>Cabinet Component Specification Overview</i> | 17 |
| <i>Guidelines for Component Specification</i> | 18 |
| CABINET & COMPONENT DETAIL | 19 |
| <i>Connectix Home Cabinet Detail</i> | 19 |
| <i>Cat5e Patch Panel</i> | 20 |
| <i>Telephone Service Panel</i> | 20 |
| <i>RF Distribution Panel</i> | 21 |
| <i>Blank Panel & Brush Panel</i> | 21 |
| CONFIGURATION EXAMPLES & SYSTEM SCHEMATICS..... | 22 |
| RF DISTRIBUTION SYSTEM | 22 |
| <i>No Sky DigiBox</i> | 22 |
| <i>Single Standard Sky DigiBox</i> | 23 |

| | |
|---|-----------|
| <i>Sky Plus DigiBox at main TV location</i> | 24 |
| <i>DigiBox connection for Multi-Room</i> | 24 |
| <i>Sky Plus DigiBox with Standard DigiBox</i> | 25 |
| ADSL FILTERING | 26 |
| ADSL EQUIPMENT CONNECTION | 27 |
| HOME CABLING SYSTEM PLANNING TABLES | 29 |
| CO-AX CABLING PLAN | 30 |
| CAT5E CABLING PLAN | 31 |
| CABINET PLANNING | 32 |
| <i>Cabinet Panel Outlet Assignment</i> | 33 |
| <i>Planning Symbols</i> | 35 |
| RF DISTRIBUTION: TV, RADIO & SATELLITE | 38 |
| COMPUTER / DATA NETWORKING - LAN | 39 |
| MULTI-ROOM AUDIO | 40 |
| AV DISTRIBUTION | 41 |
| WORKED DESIGN EXAMPLE | 42 |
| FOUR BEDROOM HOUSE | 42 |
| <i>Cabinet Panel Outlet Assignment</i> | 46 |
| FREQUENTLY ASKED QUESTIONS | 48 |

Foreword

This guide starts with a basic introduction to the subject of Home cabling Systems and defines the scope of the applications considered.

A stepped approach for home cabling system design is presented with reference to relevant sections of this guide. The associated sections (starting on page 10) are generally relevant to cabling systems and are presented to aid informed decision making.

Detail generated by the design process can be recorded on worksheets starting at page 29 – these become a parts list and documentation of the design (a worked example for a typical four bedroom house is contained at the end of this guide.)

The configuration examples and system schematics section presents application specific detail demonstrating how to use the cabling system.

Home Cabling Systems Introduction

A home cabling system provides the occupants of a dwelling with the ability to ‘connect’ a wide variety of communication, audio / video and entertainment equipment with minimal disruption, inconvenience and cosmetic impact. Equipment is ‘connected’ to provide access to incoming services and also to distribute internally generated signals around the home. For example:

- Connection of telephones to an incoming telephone service.
- Distribution of a satellite receiver output to multiple TVs.
- The ability to share an Internet connection to multiple PCs.

The foundation is a cabling system that offers:

- Connection points at locations where equipment will be used.
- Compatibility with the connected equipment.

Successful home cabling systems are based on:

- Components with required electrical performance and connections.
- Useful placement of connection points.
- Observation of practical limits to ensure signal quality is good.
- Installation to provide expected system performance.

The components of our system have been designed to operate in conformance with formal performance standards. Many applications have been designed to work within the definition of these standards.

System design must consider installation: It should be considered as ‘design for installation’. Understanding of the building into which the system will be installed and how it will be used is required. This guide has been produced as an aid to making informed choices for the production of successful designs.

Home Cabling Applications

In this guide the term ‘application’ refers to any use involving the cabling system.

Typical applications supported by our system are:

- Telephone service distribution for voice, fax, data modem and broadband equipment connection.
- RF signal distribution for delivery of terrestrial and satellite broadcast signals to TVs, Radios satellite receivers.
- Data networking for Internet connection sharing to computers, games consoles. Also, computer file and printer sharing.
- Multi-room audio distribution.

➔ Audio / video signal distribution.

Less typical applications that can affect the design of a home cabling system but which are not considered in this guide include:

| | |
|------------------|-----------------------------|
| Lighting control | Home automation |
| Security | Door entry / access control |
| CCTV Env | ironmental monitoring |

Home Cabling – General Thoughts

How much connectivity is required? What do I need to install and where?

Considerations include: Who will use the cabling system? What will be connected? How long will equipment be connected for? An accurate answer requires knowledge of the equipment to be used, its connection requirements, an understanding of the building and of the people who will use it.

At first sight the prospect of specifying a home cabling system may seem somewhat daunting, particularly if you are designing for someone else's needs. If it does, don't worry – it is common even for home owners producing designs for their own homes to feel like a lot of guess work is required!

Many applications can be achieved with any one of a number of different approaches; potentially there are many design choices to be made. However, planning a home cabling system can be simplified by considering each application in isolation.

What type of cable? How much of it? Where should it go? These questions are answered by the requirements of a particular application and by knowing the location at which equipment will be used. Examples of applications are telephone connection, TV signal distribution or computer connection for internet sharing. Knowing the connection requirements of an application allows the type of cable and connections to be identified.

Home Cabling Application Considerations

Specific application detail affects home cabling in the following ways:

➔ **The type of cable required.**

The most common types are:

- Standardised Cat5eUTP (un-shielded twisted pair.)
- Co-ax.

- Proprietary application / system specific twisted pair.

➤ **The type of connections required.**

A few are noted here and many more exist, those in the first column are most common and have most relevance to our system.

- RJ-45 jack
- Co-ax connector
- F-Type connector
- BT jack
- Binding posts
- RCA Phono Socket
- Stereo jack
- Banana socket

These are connection types that users of a system will see presented on wall outlets, cables used to connect equipment with have a matching plug. The installer works with other types of connectors for which specific tools are required.

➤ **Layout of wiring between connection points.**

It is most common for cables to radiate from one location to each connection point however other arrangements do exist.

- Star Wired - Cables run from a 'core' to connection points.
- Daisy Chain - Cable runs from point to point to point and so on.
- Ring - Like daisy chain but both ends meet at one place.

➤ **Location of devices to be connected.**

Architectural and cosmetic issues have an effect on this part of the design as too does knowledge of the devices to be connected. Typical choices are TVs, radios, telephones and computers. Less obvious ones include:

- Telephone service – if the incoming line connection is remote to the cabling system 'core' connection points need be placed near by.
- Multi-room audio system inputs and control pads. Depending on the system, keypads at light switch level or connection hardware for source equipment may need to be cabled for.
- Audio/video signal distribution systems may require general purpose cabling to be present close to TV locations.
- Security, CCTV, door entry, access control, lighting / appliance control, monitoring and other advanced systems may require connections in non-typical locations such as:
 - Ceiling void
 - External wall
 - Front door
 - Gate post
 - Light switch position
 - Storage rooms

Home Cabling System Detail Summary

The following table presents a summary of application cabling and connection requirements. Further detail is included in the application description sections located toward the end of this guide.

| | |
|---------------------------------------|--|
| Telephone / ADSL service distribution | Cat5e cable star wired to each room outlet. Room outlets are BT or RJ-45 (with voice converter). The phone line is connected to a phone service panel or phone system at the central 'core' location. |
| Broadcast TV/Radio RF distribution | Co-ax cable star wired to all TV and aerial locations. Room outlets are F-Type or Co-ax connectors. RF distribution equipment is installed at the 'core' location. |
| Computer / Data network | Cat5e cable star wired to each room outlet. Room outlets are RJ-45. An Ethernet or LAN switch is required at the 'core' location. |
| Multi-Room Audio | Cat5e cable star wired to system component locations. Connections to installed speakers and audio source input points (RCA connectors.) Wall mounted control pads may require consideration. An audio distribution is required at the 'core' location. |
| AV distribution | Cat5e cable star wired to each room outlet. Room outlets are RJ-45. Patching at the central location for room-to-room links. A distribution system may be required at the 'core'. |

In overall summary:

- Two types of cable are considered
Cat5e or Co-ax cable
- All wiring emanates from one place
Star wiring from a central location
- Applications requiring Cat5e cable will use one of two connector types
RJ-45 or BT connectors for Cat5e cable
- Applications requiring Co-ax cable will use one of two connector types
F-type or Co-ax connectors for Co-ax cable

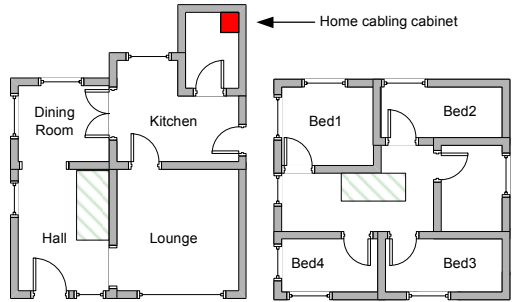
Planning a Home Cabling System

Design Steps

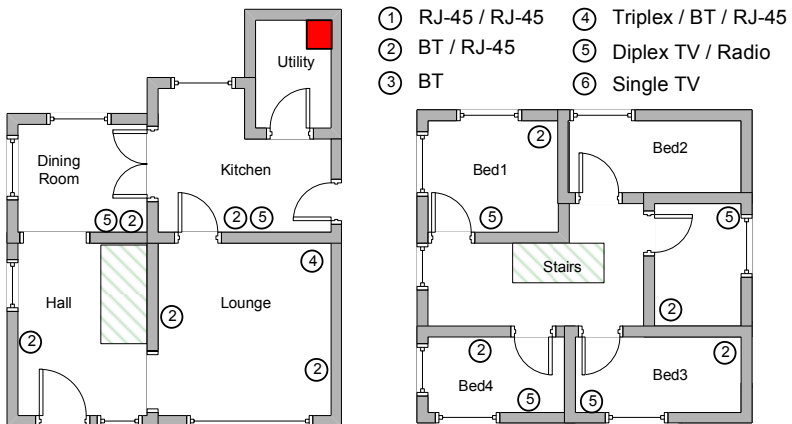
In general the steps for designing a home cabling system are:

1. Obtain or draw plans of the building.
2. Decide where the core of the cabling system is to be located.
3. Mark the locations where you want to have any of the following:
(see page 10 for suggestions)

- Wired telephone or wireless telephone base station
- Wired PC connection for internet / file / printer sharing.
- Wired connection for networked printer
- Wired connection for games console
- Connection to route AV signal to central location or another room
- Connection point for audio source input to multi-room audio system
- FM / TV / DAB aerials
- Satellite dish



4. Choose outlet configurations to suit the requirements of the equipment to be connected at each location. See page 13 for detailed description of outlet configurations.



Typical 4 bedroom house example

5. Identify cable routes and calculate the length of each run. See page 15 for cable routing considerations.
6. Complete the tables on pages 30 & 31 for cabling requirements.
7. Follow the directions on page 18 for specifying the cabinet requirements for the central location.
8. Complete the cabinet requirements table on page 32.
9. Allocate patch panel port numbers to room outlets and add this detail to the table on page 33.
10. Add detail to cabinet documentation for future reference.

Home Cabling System: Cabling

Location Specific Connections

The following suggestions are for guidance when deciding how to locate cabling system outlets. Furniture position, seasonal changes affecting the use of a room are just two of many considerations that may cause a particular design to require more or less connections than suggested here.

Hall

A single gang dual outlet with BT and RJ-45 connections would allow connection of a wired phone. A data networking device or monitored alarm panel could use the RJ-45.

Kitchen

A single gang dual outlet with BT and RJ-45 connections should be positioned for connection of a wired phone while also being in close proximity to a surface used for dining or preparation. A single or duplex TV outlet may be installed to allow positioning of a TV for viewing from preparation and dining areas.

Dining Room

A single gang dual outlet with BT and RJ-45 connections should be installed in a discrete location. Ideally it will be situated such that an equipment lead connecting to a data device on the dining table will not obstruct entrances or walk-ways. Ideally the outlets would be in close proximity to a location where a wired telephone may be situated on a side board. A single or duplex TV outlet may be situated in a discrete location offering connection to either concealed, wall mounted or free standing TV.

Living / Family room

Generally this will be the main location of TV viewing equipment and decoders for satellite or terrestrial digital services. A triplex TV system outlet will be required at the point where the satellite receiver / TV will be situated.

For phone and data connection three single gang dual outlets with BT and RJ-45 connections are suggested. One of these should be installed in close proximity to the TV location. (See the wall outlet descriptions for combined TV, Phone/RJ-45 or individual TV and Phone / RJ-45 plate options.) The other two plates should be situated close to likely seating locations.

Other reception rooms / study

A single gang dual outlet with BT and RJ-45 connections are recommended. Also, either a single or duplex TV outlet may be considered.

Garage

A single gang dual outlet with BT and RJ-45 connections should be located here.

Bedrooms

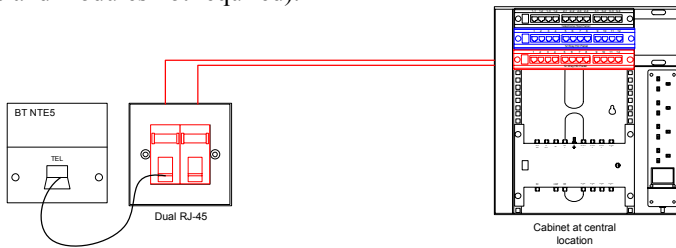
A single gang dual outlet with BT and RJ-45 connections positioned close to the bed

location is recommended. A single or duplex TV outlet is recommended placed in a location to allow connection of a TV.

Non Location Specific Connections

Telephone Service location

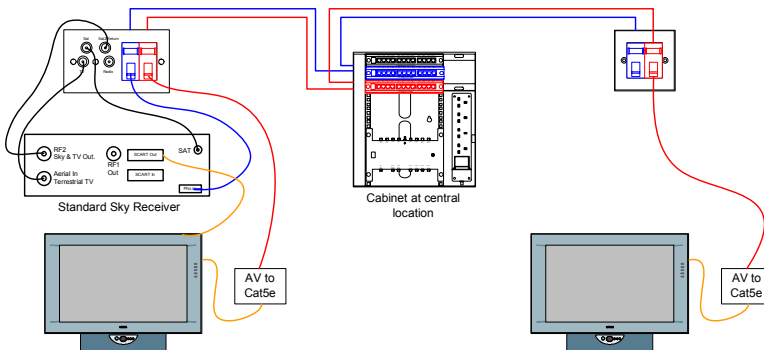
Typically a telephone service enters a building and is presented on a master socket – for a BT service this is known as an NTE5. If the NTE5 is situated away from the Home Cabling System Cabinet it will be necessary to run cable between the two locations. A direct run Cat5e cable may be terminated using the NTE5 extension wiring connection (wall plate and modules not required).



Alternatively a wall outlet with RJ-45 connections could be installed close to the master socket. One cable/connection for each incoming line is required however where only one line is initially considered it is suggested that a minimum of two cables are installed.

AV signal connection

The ability to route AV signals from one location to another allows high quality video signals and stereo sound to be route from one room to another.



The only requirement for a cabling system to support this is to place Cat5e cables terminating in RJ-45 connections at locations where satellite receivers, DVD Juke Box or media centre computers with AV outputs will be located. Cat5e cables with RJ-45 connections should be located close to TV locations where the video signal will be received and connected to display devices.

Outlet Options

Outlets for Cat5e cabling

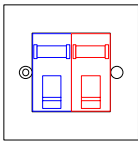
Cat5e cables terminate onto outlets which may offer either an RJ-45 or BT type connector. A modular approach allows flexible selection of the number and combination of outlets offered at a particular location.

Outlet modules clip into a fixture known either as a wall plate or alternatively as a face plate. The wall plate attaches to a back box which is either recessed into the wall or surface mounted. Two sizes of wall plate are available:

- A single gang plate accepts one or two modules; it is the same size as a typical UK light switch plate.
- A dual gang plate accepts up to four modules; it is the same size as a typical UK dual mains outlet.

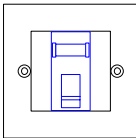
Where the number of modules to be installed is less than the number of spaces provided by the wall plate the empty space must be blanked off. A pair of ¼ blanks fills one module space and allows installed modules to be positioned centrally in the plate.

Typical configuration examples are illustrated here:



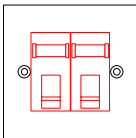
BT RJ-45

Single gang double outlet configured with BT and RJ-45 modules. Two Cat5e cables are required to be run to a wall plate configured as shown.



BT

Single gang single outlet configured with one BT type connection. Note the use of the ¼ blanks to fill empty space and centralise the module. One Cat5e cable is required to be run to an outlet configured in this way.

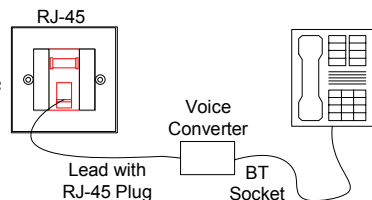


Dual RJ-45

Single gang double outlet configured with two RJ-45 connections. Two Cat5e cables are required to be run to an outlet configured in this way.

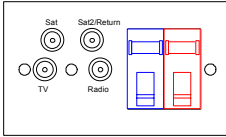
Note: A number of modular systems exist each having different physical sizes. In general our plates accept CCS size modules however if using plates from other suppliers you may need modules that comply with the EuroMOD 50*25mm standard.

A voice converter can be used to adapt from RJ-45 to BT. A lead with RJ-45 connects to the outlet, the BT socket is in the body of the converter.



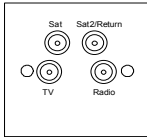
Outlets for RF TV/Radio signal distribution

Unlike outlets for use with Cat5e cabling, RF distribution system outlets are not modular. However one combines an RF component with a module space for two Cat5e modules.



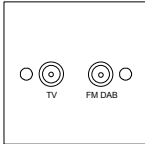
Multi RF BT RJ-45

Dual gang size triplex RF plate with TV, radio, satellite dish and RF return connections combined with EuroMOD aperture slot. Two co-ax cables are required. Cat5e cables will be required for each EuroMOD module installed.



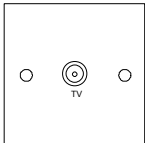
Multi RF

Single gang size triplex RF plate with TV, radio, satellite dish and RF return connections. Two co-ax cables are required.



Diplex FM/TV

Single gang size diplex RF plate for TV and radio connection. One co-ax cable is required.



Single TV

Single gang size TV outlet for TV connection. One co-ax cable is required.

Note: The system requires one triplex plate to be installed at the location where the main satellite receiver will be located. This is the receiver that will be viewable and controllable from other locations. Two Co-ax cables are required for connection to this location – see schematics for more detail.

Outlet back box specification

The minimum recommended depth for a back box used to mount any of the plates for Cat5e or Co-ax cabling is 32mm. However, if you can fit deeper boxes then you should. The greater the back box depth the better.

Cable Route Considerations

The paths used to route cables from the home cabling cabinet and wall plate locations should be identified as part of the design process. A few areas of consideration are given here:

➤ **Mechanical security**

Damaged Cat5e cables will not give optimum performance if joined. Some data systems may not work under these circumstances. Co-ax cables are not so critical in this respect however continuous cable runs are preferred.

Damage due to accidental drilling is reduced by allowing clear identification of cable paths: only run cables vertically down walls and inline with wall plates. Plaster and concrete contain chemicals that attack PVC cable insulation over the course of time. All cables to be buried in floor screed or covered over with plaster must be capped or run in conduit. Floor screed can also contain fine grade aggregate which cuts into cable.

➤ **Protection from water**

PVC Cat5e cable has a porous outer insulating jacket. Water ingress alters the performance of the cable making replacement the only path to rectification. External installations are possible but must consider the use of external grade Cat5e cable.

Co-ax cables for external installation to satellite dish and aerial locations should be of a foam filled construction with any joints being sealed with self-amalgamating tape.

➤ **Separation from power, safety & interference**

Regulations stipulate that low voltage cabling will have a minimum 50mm separation from power cables unless the power is contained within conduit. Interference can be a concern however for the applications considered there is no need to use shielded Cat5e cable or components. The following good practices should be observed at both design and installation time:

- Maintain 300mm separation between power and Cat5e cables.
- Cat5e cables and power cables cross at 90 degrees to each other.
- Keep parallel runs of Cat5e and power cable as short as possible.
- Avoid running data cables close to fluorescent light fittings.

➤ **Minimum bend radius**

Cat5e and co-ax cables only give optimum performance if minimum bend radiuses are observed. During installation Cat5e cables should not be bent to more than 75mm, after installation 25mm is acceptable.

Foam filled external co-ax has a minimum bend radius of 70mm. Indoor grade cable typically allows 35mm. Cable paths should be chosen with this in mind.

➤ **Length Limitations**

Cat5e cables are limited to a maximum of 90m from the cabinet location to the wall plate. The TV distribution system has practical limits however there is no similar rule. With good input signal quality and sensible cable routes typical 5/6 bedroom dwellings will be within limits.

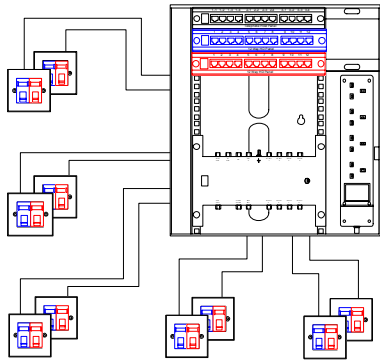
Home Cabling System: Core

Home Cabling System Cabinet

Cables connected to wall outlets run to a common point referred to as the central location or, alternatively, as the core of the cabling system.

The number of cables arriving at this point can be large leading to the need to organize and present them in a tidy and meaningful manner.

The cabling system core allows devices situated in room locations to be connected via the cabling system to application specific services or equipment. A patching facility provides this function; patch leads are used to make the link between wall outlet cable connections and application specific services and equipment.



Hardware used to terminate cable and possibly some of the application specific equipment required at the core will be contained in a cabinet. Often the central location will be simply referred to as ‘the cabinet’.

Cabinet Location

Selection of a cabinet location is based on:

- **Suitable location for cable consolidation**
Physical cable pathways, the need for specialist drilling and, in large buildings, maximum distance limitations need consideration.
- **Physical space for cabinet mounting and access**
The cabinet needs to be located so as to be accessible but not be physically or cosmetically intrusive.
- **Space to accommodate non-cabling equipment**
Music and video source equipment may need to be accommodated since direct connection to equipment contained within the cabinet is often required. Also, in many situations such equipment simply has no need to be anywhere else. Data networking devices may also need to be located in close proximity to the cabinet. A router for Internet connection sharing is typical of such a data networking device. Space and heat dissipation must be considered in this scenario.

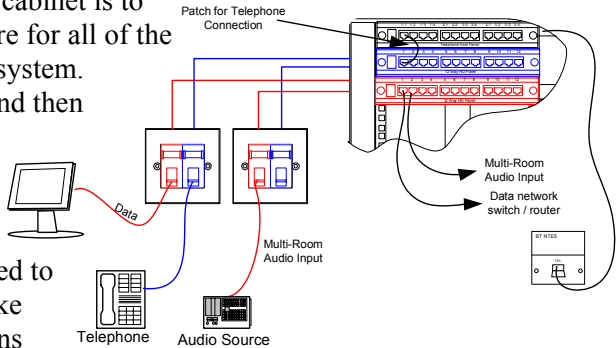
Cabinet Component Specification

The primary purpose of the cabinet is to contain terminating hardware for all of the cables of the home cabling system.

The cables are terminated and then presented on RJ-45 sockets

allowing connections to equipment or other outlets to be made as required. Patch leads are used to make the connections. Unlike wall outlets in room locations

many cables terminate at the cabinet; many sockets are required in a relatively small space. To achieve this RJ-45 sockets are arranged in high density groups as either panel mounted modules or patch panels. The hardware allows a specific wall outlet to provide access to a particular application based on the connection made at the cabinet.



many cables terminate at the cabinet; many sockets are required in a relatively small space. To achieve this RJ-45 sockets are arranged in high density groups as either panel mounted modules or patch panels. The hardware allows a specific wall outlet to provide access to a particular application based on the connection made at the cabinet.

The number of ports available in the cabinet, how they are arranged and how they are labeled are important considerations when it comes to ensuring the system will be clearly understandable and usable.

Cabinet Component Specification Overview

Cabinet component requirements are based on:

- Provision of connection points onto which installed cabling will be terminated. This allows the number of patch panels or panel modules to be identified.
- Arrangement of components to produce an easily understood layout. This is a design issue which does not affect component choice.
- Identification of application specific hardware suitable for installation within the cabinet. Such items include telephone line sharing hardware, data switch for data networking, a TV distribution system or a multi-room audio system. This consideration has an impact based on the amount of space required to accommodate wiring hardware and application specific equipment.

Guidelines for Component Specification

The following suggestions have been provided to aid cabinet specification based on requirements of the home system.

➤ **Patch panel arrangement**

Use the statements below to choose how Cat5e cables will be terminated onto panels.

- *Wall outlets only provide RJ-45 connections.*

Equipment requiring BT type sockets will use a voice converter connected to the wall outlet providing adaptation between RJ-45 and BT.

All Cat5e cables will terminate onto the same panel and be numbered in order.

- *Both RJ-45 and BT type connections have been installed.*

For ease of use and clarity cables with BT sockets at the wall outlet should terminate on different panels to cables terminated with RJ-45. Colour coded panels can help provide greater clarity. In this guide Red is used for cabling with RJ-45s, blue is used for links to BT outlets.

➤ **Telephone service panel**

If one or more incoming phone lines is to be distributed to wall outlets using the home cabling system a telephone service panel will be required. The number of lines and the number of extensions to be connected to each line will determine how many panels will be required. (See cabinet component detail for more information.)

➤ **RF Distribution system**

If the home cabling system is to be used for TV and radio broadcast signal distribution this item will be required.

➤ **LAN switch**

A data network is required for shared internet connection to multiple PCs or for streaming media / media centre computer / game console connection. A LAN switch will be required at the home cabinet location to support this. In some cases a small 8 port switch can be located within the cabinet. In some situations a larger switch may be located externally to the cabinet.

➤ **ADSL / Broadband Router**

A device called a router is required for sharing an internet connection between multiple PCs. The router connects to the telephone line and the data network. If space permits, and if the router is not a wireless device, it may be placed within the cabinet.

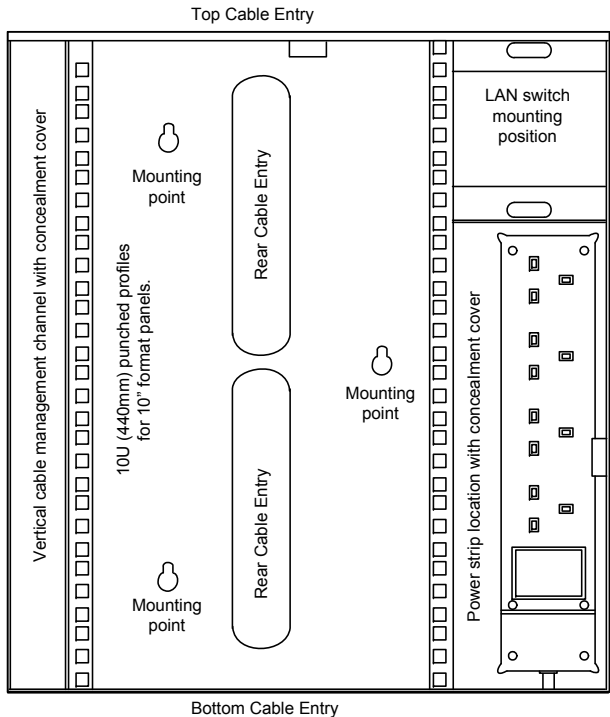
Cabinet & Component Detail

The following sections provide detailed descriptions relating to the cabinet and some of the components typically found installed within it.

Connectix Home Cabinet Detail

The Connectix Home Cabinet is a low profile metal enclosure with top, bottom and rear cable entry points. Overall dimensions are 415mm wide, 450mm high and 105mm deep. Internal arrangement of the cabinet provides space to accommodate cable termination hardware, an RF distribution system, a low port count LAN switch, a broadband router and a power distribution unit.

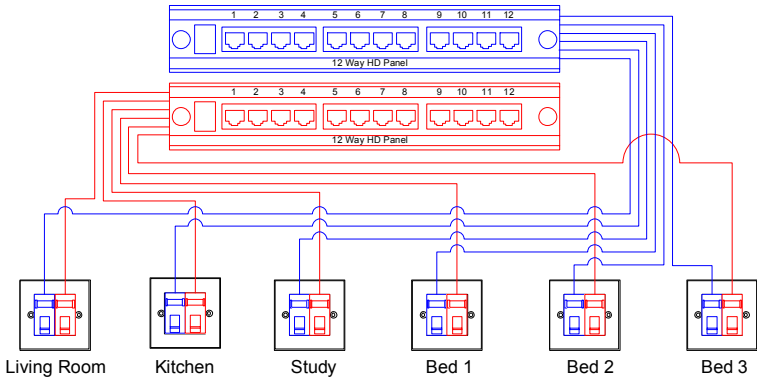
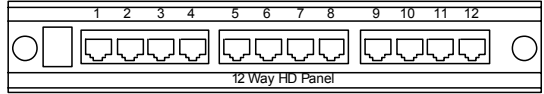
The punched profiles provide mounting points for the telephone host panel and Cat5e patch panels. The RF distribution system is also based on a panel which mounts onto the profiles.



Often it is desirable to install LAN switch devices and Internet connection sharing routers within the cabinet (space permitting.) However, due to the diversity and range of these items there is no specific mounting accommodation. Common solutions are based on the use of self adhesive Velcro fixings.

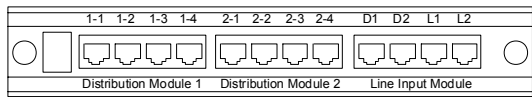
Cat5e Patch Panel

A Cat5e patch panel is used to terminate Cat5e cabling connecting the cabinet location to room wall outlets. Wall outlets may be configured with either RJ-45 outlets or BT outlets or a mixture of the two. For ease of understanding and clarity it is suggested that cables connecting to BT wall outlets are presented on a different panel to those connecting to RJ-45 wall outlets. Color coding options exist to allow the use of different colored panels for different purposes.



Telephone Service Panel

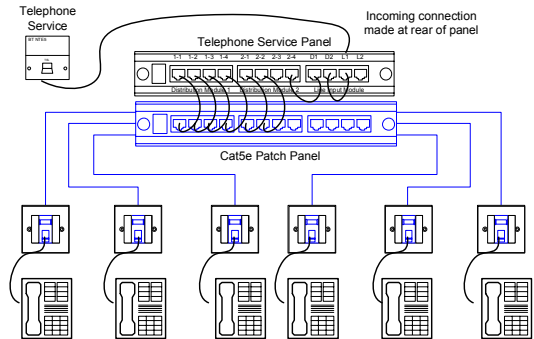
The telephone service panel is required to distribute an incoming telephone line to multiple room locations. The panel is arranged as two independent distribution modules and a line input module. One or two incoming services can be connected to the input module and patched to the distribution modules. Each distribution module allows an incoming service to be distributed to a maximum of four room outlet connections. Alternatively, modules can be linked together to allow distribution of a line to seven locations. In this configuration a second line on L2 can only be distributed to a single location.



An incoming telephone line is terminated onto the rear of the input module using either the L1 or L2 ports. A patch lead is used to connect the line on L1 or L2 to one of the distribution modules using the D1 or D2 ports.

Cables connecting incoming lines to the home cabling system may be hardwired into the master socket or linked via an RJ-45 wall outlet and link lead – this option needs to be considered when specifying parts for your system as component requirements change.

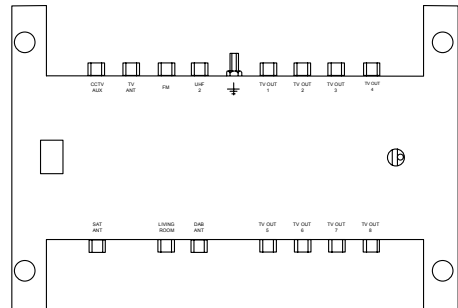
Another consideration is the need for connection of a micro filter where an ADSL broadband service is being supplied on an incoming telephone line. Please see the schematics section for more detail regarding telephone service connection, ADSL filtering and ADSL equipment connection.



RF Distribution Panel

RF broadcast signals can be distributed to a maximum of nine rooms using the RF distribution system. It is designed to incorporate the output from a Sky™ DigiBox satellite receiver while allowing remote control of the DigiBox from any room equipped with suitable remote control equipment.

All incoming RF signals from terrestrial and satellite aerials connect to the RF distribution system which can also accommodate RF modulated CCTV camera signals. The room wall outlets providing connection of TVs connect directly back to the room outlets on the TV distribution system without passing through a patching facility.



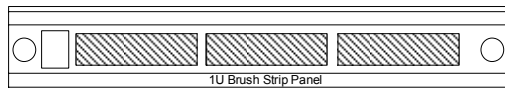
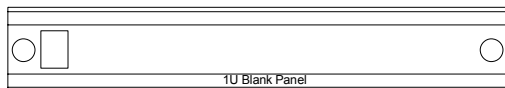
Please see the System Schematics section on page 22 for connection examples relating to this component.

Blank Panel & Brush Panel

Empty spaces in the cabinet may simply be left un-occupied or, alternatively, filled with either a blank panel or a brush strip panel.

The blank panel is solid and covers anything behind it.

The brush strip panel has three cut-outs which are filled with flexible bristles allowing cables to connect from one side of the panel to the other. This is useful where devices outside the cabinet are patched to patch panel ports or other equipment inside the cabinet.



Configuration Examples & System Schematics

Further detail relating to the subjects of previous sections is given here in the form of schematics and configuration examples. Typical situations are considered, many other possibilities exist which are not presented here.

RF Distribution System

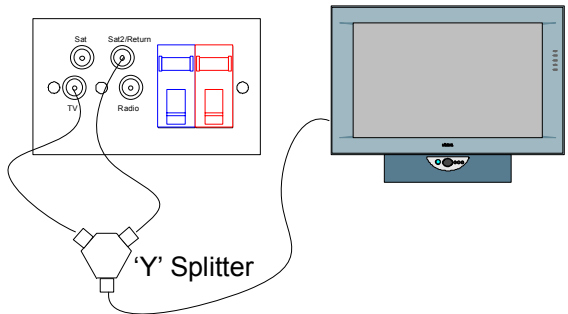
The RF distribution system can be used to distribute terrestrial analogue and digital signals to rooms serviced by the Co-ax cabling system and appropriate wall outlets. It is also designed to accommodate both the signal reception and video output of a Sky™ satellite system. The schematics presented here cover a number of configurations from terrestrial only service to a multi-room Sky™ service incorporating a receiver at the main viewing location with standard DigiBoxes situated in other room locations.

Configurations shown here include:

- No Sky Digibox
- Single Standard Sky Digibox
- Sky Plus Digibox at Main TV Viewing Location
- DigiBox connection for Multi-Room
- Sky Plus Digibox with Standard Digibox

No Sky Digibox

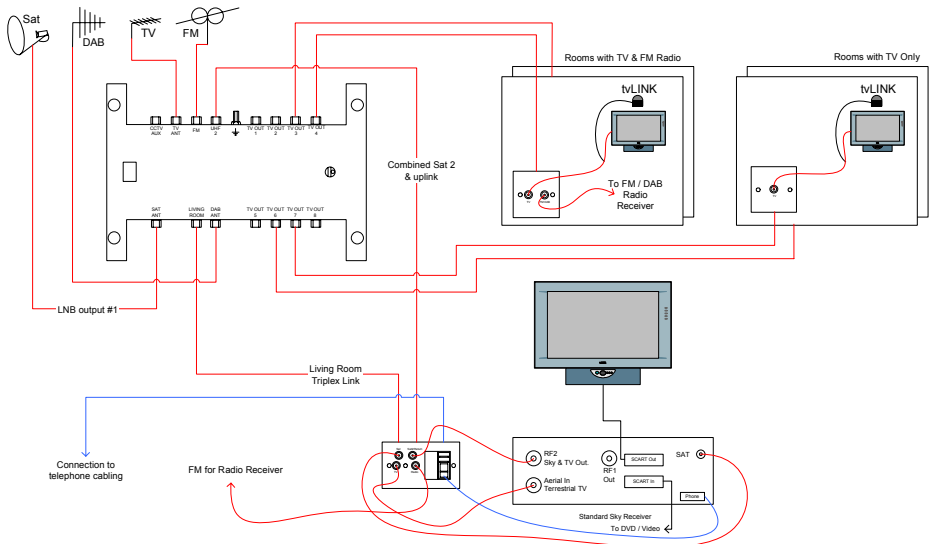
If the system is to be operated without a Sky DigiBox being present a 'Y' splitter must be used to loop the TV output back to Sat2/Return while also allowing connection to a locally situated TV.



Single Standard Sky DigiBox

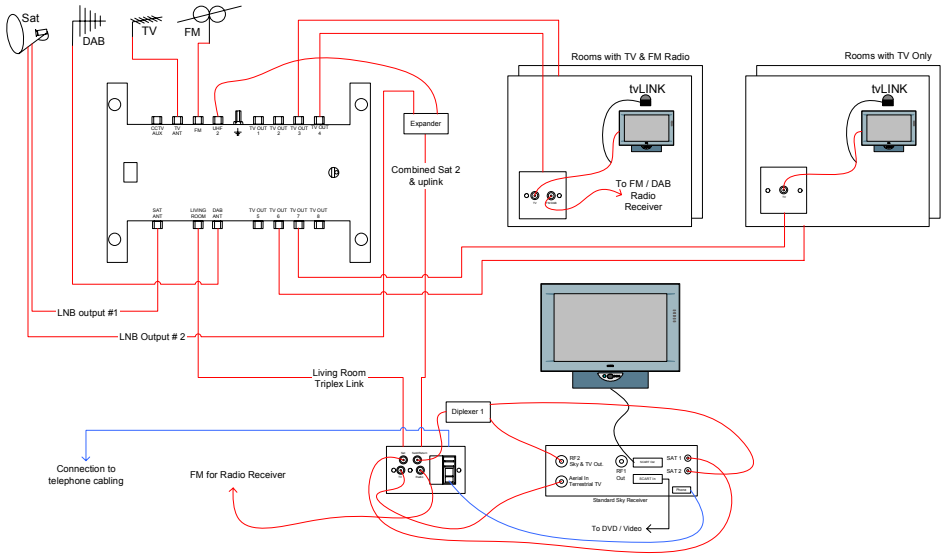
The schematic shows how received broadcast signals are connected to the home TV distribution system. All incoming signals are sent to the triplex plate on a single co-ax cable at which point they are split for connection to relevant equipment.

The terrestrial broadcast signals are connected to the RF in socket on the Sky DigiBox. The selected Sky channel is mixed with the terrestrial RF signals and made available on the RF outputs. The RF2 output on the Sky DigiBox must be connected to the Sat2/return connection on the triplex plate if any of the connected rooms are to receive a TV signal.



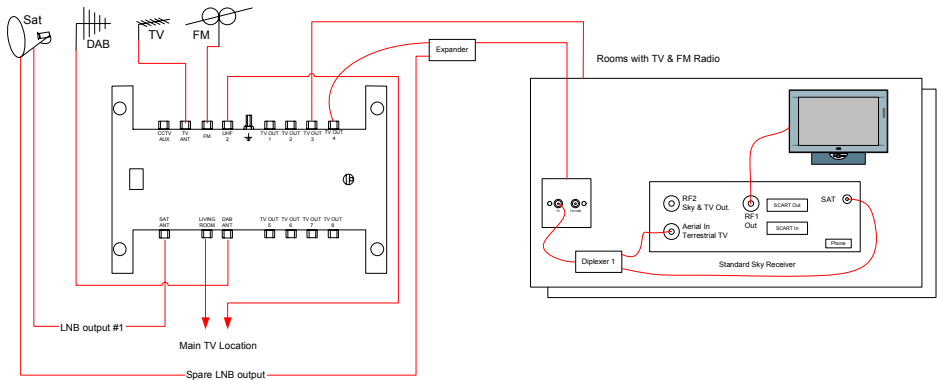
Sky Plus DigiBox at main TV location

A Sky Plus DigiBox may be used at the main TV location by supplying a second satellite dish LNB connection. This is achieved by diplexing the second feed onto the 'uplink' cable; the Expander is used at the cabling cabinet and the diplexer at the DigiBox location.

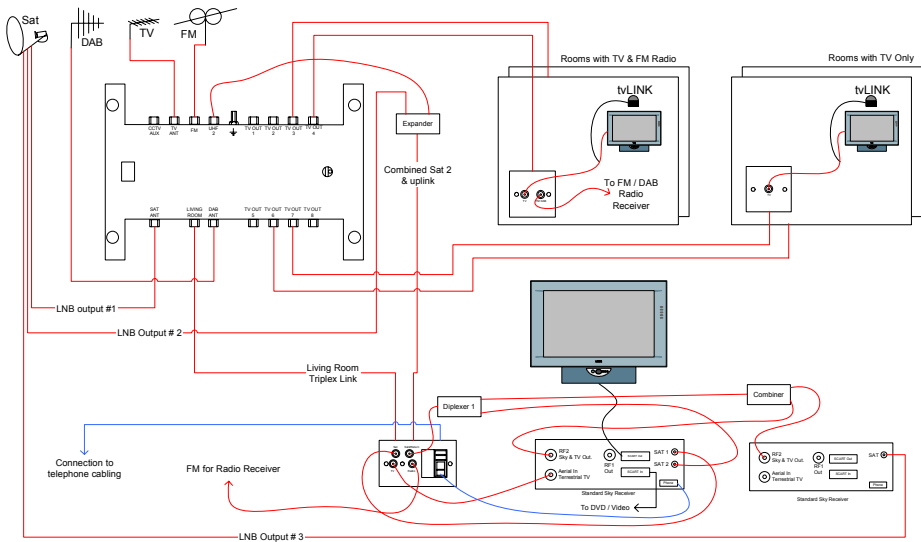


DigiBox connection for Multi-Room

An expander and diplexer can be used to connect a spare LNB output to any of rooms cabled for connection to the TV distribution system. This allows use of multiple Sky DigiBoxes in multiple locations simultaneously.



Sky Plus DigiBox with Standard DigiBox

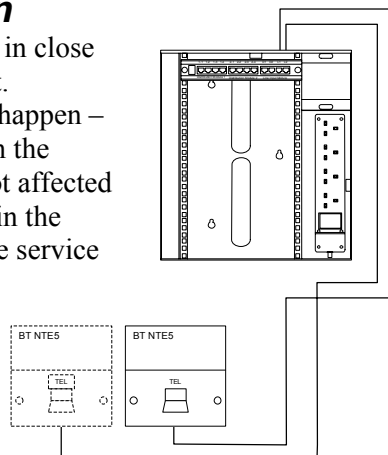


This configuration is possible although not very common and exists outside of the typical scope of the cabling system planning process presented in this guide. A third co-ax cable is required to be presented at the main viewing location. This runs directly from the satellite dish to the location of the DigiBox. Use of the ‘combiner’ allows viewing of the channel selected on the extra DigiBox however remote control via the TV Link system is not possible.

Telephone Service Connection

Ideally the telephone service will be installed in close proximity to the home cabling system cabinet. However, it is not always possible for this to happen – often it will be mounted on an outside wall on the ground floor. The plans for this system are not affected by this consideration – the only difference is in the length of the cables that connect the telephone service to the home cabinet.

A telephone service can be hardwired directly into the telephone service panel as shown here.



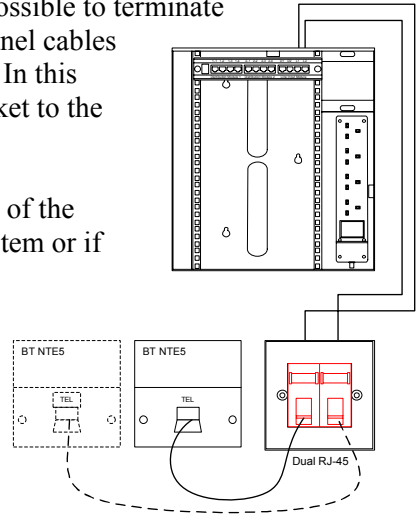
The BT NTE5 has a removable user panel which when removed reveals a set of IDC positions used for extension wiring connection. When the panel is removed extension wiring is isolated from the NTE5. When testing a fault BT will ask for extension wiring to be disconnected from the service. This may be done by removing the user panel.

If only one NTE5 is installed a second cable should be run and neatly tied up for future addition of new phone services.

Instead of hardwiring to the NTE5 it is also possible to terminate the home cabling system telephone service panel cables onto RJ-45 modules installed in a wall outlet. In this case a link lead is used to connect the BT socket to the home cabling system outlet.

This arrangement may be desirable if the user of the system will be commissioning the cabling system or if the telephone service is yet to be installed.

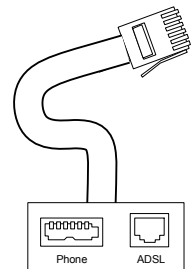
Isolation of the cabling system from the telephone service is easily achieved simply by disconnection of the link lead.



ADSL Filtering

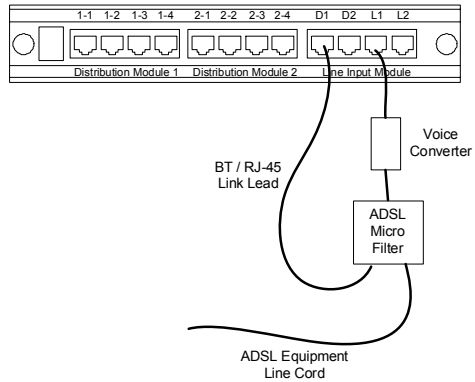
ADSL broadband is a service offering high speed internet access on existing standard analogue telephone lines. The line is shared by both services; voice calls and internet access are supported simultaneously on the same incoming cable without interference. However, the ADSL service creates audible noise that will be heard during telephone calls made using the line.

A micro filter is used to stop noise from the ADSL service being heard by telephone users. The micro filter also has the function of providing an extra connection into which the ADSL equipment can be connected; it is common to hear the micro filter referred to as a 'splitter' for this reason. ADSL equipment does not use either the BT or RJ-45 connector but instead uses an RJ-11 connector.



Typical telephone extension wiring requires a micro filter for each and every phone connection. Some home owners find this unsightly in positions where wall outlets are visible.

The telephone service panel offers a method of connecting and patching telephone lines within the home cabling system cabinet allowing the use of a single micro-filter for the whole system. The micro-filter is installed within the cabinet leading to a neat and tidy solution to the need for filtering.



ADSL Equipment Connection

An ADSL service supports connection of one piece of ADSL equipment: One router or one modem. The distinction between these pieces of equipment has become confused with different types of devices being labeled ‘modem routers’.

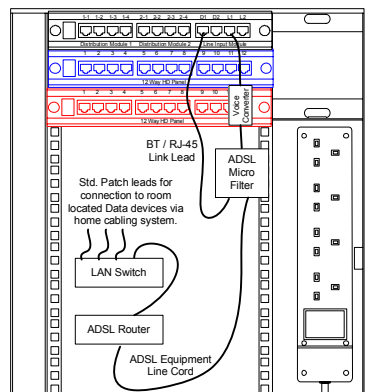
Generally a modem is a device that connects one piece of equipment, such as a PC, to an ADSL service. A router usually provides a ‘shared’ internet connection to multiple devices such as PCs and game consoles.

A router shares internet access to data networking devices using a LAN connection. As described on page 39 a LAN switch is reqd at the home cabling system cabinet to enable data networking through the home cabling system.

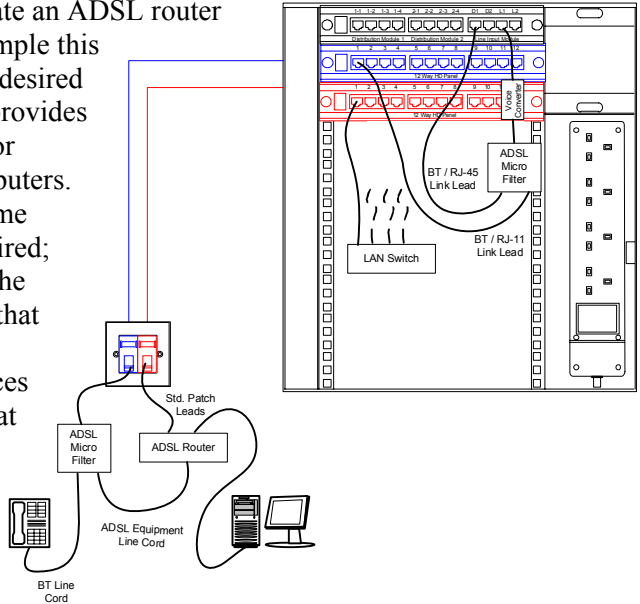
The micro filter provides an RJ-11 socket for connection of ADSL equipment using a cable known as a ‘line cord’.

The ADSL equipment may be situated within or in close proximity to the home cabling system cabinet.

Some routers have a LAN switch built in, others do not. In this configuration, if the router has enough ports to connect the number of devices required the stand alone switch can be left out of the design – the patch leads would then connect directly into the ADSL router.



It may be preferable to situate an ADSL router in a room location. For example this may be necessary to obtain desired coverage where the router provides wireless WiFi connection for devices such as laptop computers. Two connections on the home cabling system will be required; one for the ADSL service, the other for a data connection that makes the internet service available to other data devices via a LAN switch installed at the cabinet location.



The example makes the following assumptions:

- The router has multiple LAN ports. Where this is not the case the router may be connected to a LAN switch to provide more ports.
- The room outlet has BT and RJ-45 sockets. If the outlet had two RJ-45s a voice converter would be required before the micro filter.
- Telephone connection will be to the line on which the ADSL service is provided. If an alternative line is to be available in the room it would have to be provided on a different port.

NOTE:

Some telephone equipment will not ring to signal an incoming call with the configuration shown; receiving and making calls will work. BT compliant equipment uses a ring signal generated by the master socket to detect an incoming call. Other equipment senses an incoming call from the line (the phone is internally mastered) and therefore does not care about the signal generated by the master socket. The ADSL micro filter does not propagate the ring signal generated by the master socket; therefore in the above example it is not available at the telephone connection in the room.

Should you find this to be the case the options are:

- Change the telephone equipment for an internally mastered device.
- Move the router to a different room.
- Move the telephone equipment to a different room.
- Patch the phone service via an alternative port if available.
- Rely on hearing phones ring in other rooms.

Home cabling system planning tables

The tables that follow are designed to aid the home cabling system design process resulting in the basis of system documentation and a parts list.

The first three tables consider Cat5e cabling, co-ax cabling and the cabinet hardware requirements separately.

The fourth table is provided to allow cabinet patch panel assignments to be made

The following notes are given to clarify the table use:

Co-ax cabling

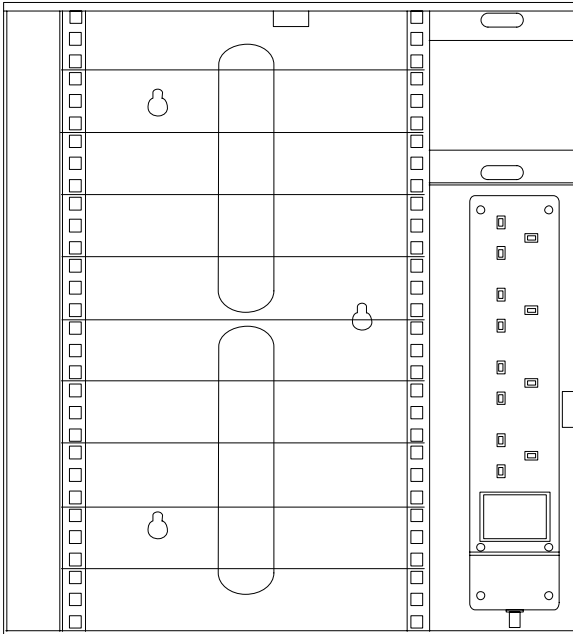
- ◆ Identify each position where an outlet is required by the room name and wall location. This can be a descriptive name or drawing reference.
- ◆ Identify the plate type required. At least one triplex plate is required.
- ◆ Note extra hardware requirements for each outlet. It is normal for the expander and diplexer to be installed as a pair.

Cat5e cabling

- ◆ Identify each position where an outlet is required by the room name and wall location. This can be a descriptive name or drawing reference.
- ◆ Identify if the plate required is a single or a double.
- ◆ Enter the number of terminations of each type required for the location. RJ-45 and BT relate to module types which may be either Euro or CCS depending on the face plate type (signifying this against the entry will aid calculation of part requirement totals.) Direct termination signifies that a module is not required. For example where a cable run terminates onto the extension wiring facility of a BT master socket or a pair of speakers in a multi-room audio system.
- ◆ The port number allocation columns allow patch panel ports to be allocated as the design is built up. Maintaining these entries will make identification of cabinet component requirements easier.
- ◆ The 'Blank' column is used to signify the number of blanks required to fill empty faceplate positions for the location considered.
- ◆ The VC column can be used to account for voice converter requirements at a location.

Cabinet Planning

| Part No. | Description | U Space | Qty |
|----------------|--|---------|-----|
| 009-003-001-02 | 2 Line Telephone Service Panel | 1 | |
| 009-001-016-00 | 12 Way Enhanced Cat5 Patch Panel Black | 1 | |
| 009-001-016-04 | 12 Way Enhanced Cat5 Patch Panel Blue | 1 | |
| 009-001-016-08 | 12 Way Enhanced Cat5 Patch Panel Red | 1 | |
| 009-003-002-01 | TV Distribution Panel | 4 | |
| 009-001-021-08 | 1U Blank Panel | 1 | |
| 009-001-020-00 | 1U Brush Panel | 1 | |

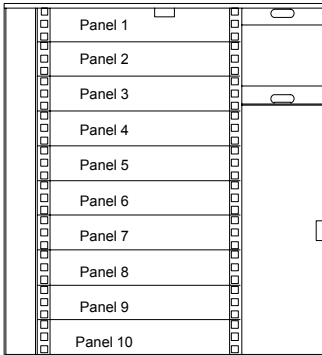


Cabinet Layout Notes

NOTE: Each U position has been marked to aid planning. Either write in the item planned for each space or alternatively cut out the component symbols on page 35 and position as required.

| Additional Hardware | | |
|---------------------|---|-----|
| Part No. | Description | Qty |
| 010-100-100-08 | 8 port LAN Switch | |
| CABLEKIT | Router connection kit 2 * secondary Voice Converter, 2 * Micro filter, 1 * BT / RJ-45 Link Lead, 1 * RJ-11/ RJ-45 Link Lead | |
| VELCROKIT | Velcro fixing kit | |
| 009-000-001-00 | Individual Cage Nut | |

Cabinet Panel Outlet Assignment



| No | Description |
|----|-------------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |

| Port No. | Panel Number | | | | |
|-----------------|--------------|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| Room / Location | | | | | |

| Port No. | Panel Number | | | | |
|-----------------|--------------|---|---|---|----|
| | 6 | 7 | 8 | 9 | 10 |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| Room / Location | | | | | |

Cabling System Application Notes

The following application notes have been designed to provide a brief introduction to each of the typical applications which use the home cabling system specified in this guide.

Each application note follows a format describing the application in terms of what it does, how it uses the cabling system, the connection types commonly encountered and the type of cable required. This information is summarized in the table on page 7.

Typically encountered exceptions and alternative options for realizing the application are also provided however it must be understood that the information provided is far from exhaustive in this area.

Telephone service distribution

What does it do?

An incoming telephone service can be provided to one or more points within the dwelling. Fax machines and dial-up computer modems can connect. ADSL broadband services can also be routed to a room location however the use of micro-filters will need to be considered.

What do I need to connect to the cabling system?

Telephones connect at the room location. At the central location a telephone host panel / module is required to accept the incoming service and allow it to be patched through to multiple room outlets.

What type of cable is required?

While not required Cat5e or Cat6 is recommended – particularly if terminating to RJ-45 at the room locations.

How is it wired?

Star wired – each room outlet has a dedicated cable running back to the central location where it terminates onto a patch panel.

What connections are required?

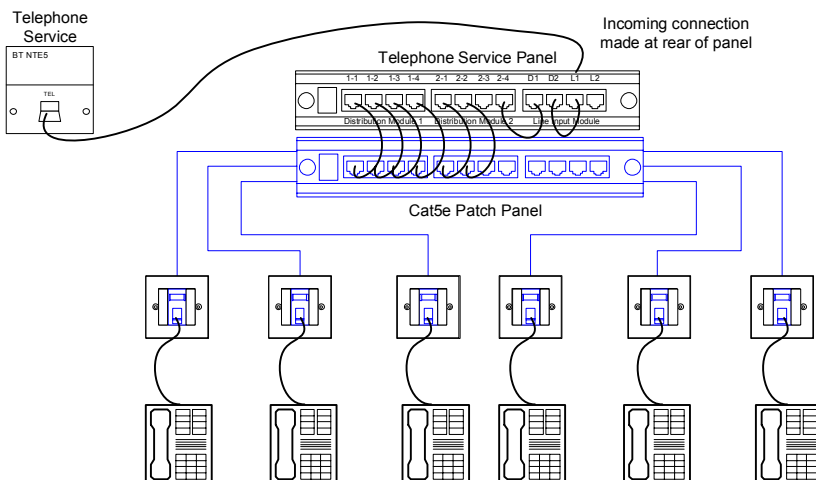
The room locations can be either sockets for BT type plugs or RJ-45 (requires the use of plug-in voice converters.)

Are there any exceptions?

A phone line can be wired as a daisy chain from the incoming service to each outlet location however this does not fit in with the concept of general purpose structured cabling.

Alternative solutions?

A phone system can be used in which case the host panel is not required. The phone system will be situated close to the central location and will need to connect to both the incoming service and the room outlet patch panel



RF Distribution: TV, Radio & Satellite

What does it do?

Broadcast TV, Radio and satellite signals are distributed to rooms in the dwelling. The selected satellite channel from a DigiBox may be viewed on TVs in other rooms. Remote control of the satellite receiver may be possible.

What do I need to connect to the cabling system?

A TV signal distribution unit is required at the central location. Radios, TVs or satellite receivers / set top boxes are required in the room locations. 'Magic eye' remote control receivers may be used to allow remote control of a satellite receiver in another room.

What type of cable is required?

Co-ax cable is required for all aerial and room locations.

How is it wired?

Star wired between the central location and all room / aerial locations. Aerial and satellite dish signals are brought to the central location, room points provide connection to TVs and radios. Multiple cable runs to the same location may be required (see instructions for your TV distribution system.)

What connections are required?

Room outlet locations have connectors specially designed for RF signal connection; Co-ax and F-type connectors are typical.

Are there any exceptions?

The room(s) where satellite receivers / digi-boxes are to be placed often require special consideration. Some distribution systems are designed to work with particular configurations and may not offer the same functionality for all uses.

Alternative solutions?

Some cabling systems use a proprietary twisted pair cable allowing RF signals to run over the same cabling as used for data, audio or telephone connections. Higher quality AV signals offering a better picture and stereo sound can be sent on Cat5e and Cat6 cabling using signal conditioning equipment. Multi-source AV distribution solutions for use on Cat5e or above are not uncommon.

Computer / Data Networking - LAN

What does it do?

Equipment designed to communicate using the Local Area Networking (LAN) technology Ethernet can be connected. Computers and games consoles can be connected to communicate with each other or with equipment for sharing an Internet connection. Media centre computers and other digital media devices can share video, music and image files with this type of connection.

What do I need to connect to the cabling system?

A LAN switch is connected at the central cabinet location. PCs, digital media devices, network printers, games consoles and internet telephone devices are connected in room locations. For internet sharing a router with connection to the internet service is required, this will also be connected to the switch. The home cabling system enables the connection of room located data networking devices to the switch located in the cabinet. Alternatively devices which do not need to be present in room locations may be installed at the cabinet location and directly connected to the switch.

What type of cable is required?

Cat5e or Cat6

How is it wired?

Star wired – each room outlet has a dedicated cable running back to the central location where it terminates onto a patch panel.

What connections are required?

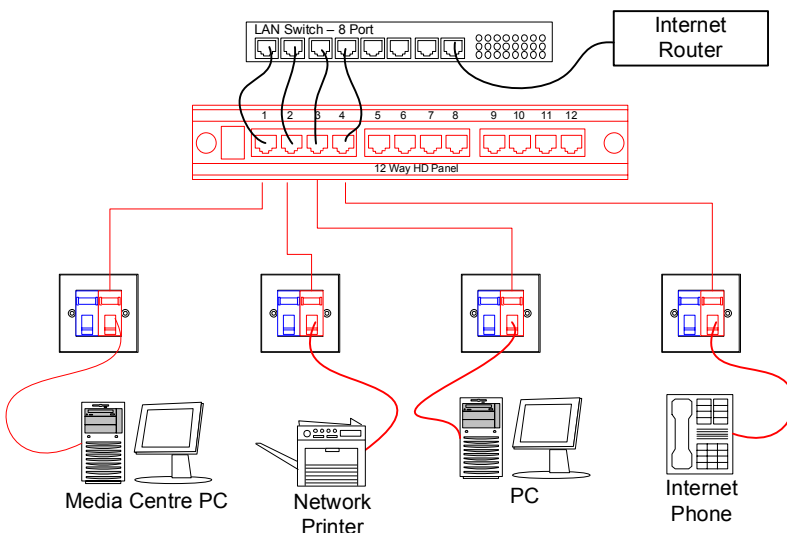
RJ-45

Are there any exceptions?

No ne

Alternative solutions?

Wireless and HomePlug for power line networking.



Multi-room Audio

What does it do?

The output from one or more audio sources can be listened to in rooms where connected speakers are installed. Sources may be situated at the central location or in rooms where suitable connections points are installed. Depending on the system installed features can include control to allow selection between different sources or control of the selected source itself. This may be via a wall mounted key pad or an infra-red based remote control system.

What do I need to connect to the cabling system?

There will be a piece of equipment located centrally which has source inputs and 'zone' outputs. Permanently installed room speakers will have 'hidden' wires connected. Source input plates and key pad controls may be required.

What type of cable is required?

Typically Cat5e.

How is it wired?

Depending on the complexity of the system it may be star wired from the central location to speakers and source input connection points. Alternatively it could be a combination of star wired and daisy chain. A thorough understanding of the system you are designing for is required!

What connections are required?

Generally the only connection will be a source input plate offering Phono type sockets. However, some systems are available with adaptors which allow audio source signals to be sent from a room location to the central location using typical Cat5e cabling presented in a room location on an RJ-45 outlet.

Are there any exceptions?

Alternative solutions?

There are many ways to achieve multi-room audio solutions. The description is based on the QED System Line Modular solution.

AV Distribution

What does it do?

High quality analog component/composite video combined with audio signals can be sent across Cat5e / Cat6 cabling to equipment such as TVs.

What do I need to connect to the cabling system?

Transmit and receive adaptors have to be used to condition AV signals for transmission on Cat5e/Cat6 cabling. This application may be used to create direct point-to-point links from a source to a receiver – in this case only the adaptors are required – a patch lead may be required at the central location if linking a transmitter in a room to a receiver in a different room. Alternatively equipment connected to the centre of the network can provide a switching function allowing multiple receivers to select from one of a number of connected sources.

What type of cable is required?

Cat5e or Cat6

How is it wired?

Star wired – each room outlet has a dedicated cable running back to the central location where it terminates onto a patch panel.

What connections are required?

The adaptor typically has an RJ-45 for the cabling system connection and RCA or SCART for connection of the source / receiving equipment.

Are there any exceptions?

Some systems are available for use with dedicated co-ax cable.

Alternative solutions?

Digital component can be connected across Cat5e / Cat6 cable with suitable adaptors.

Worked Design Example

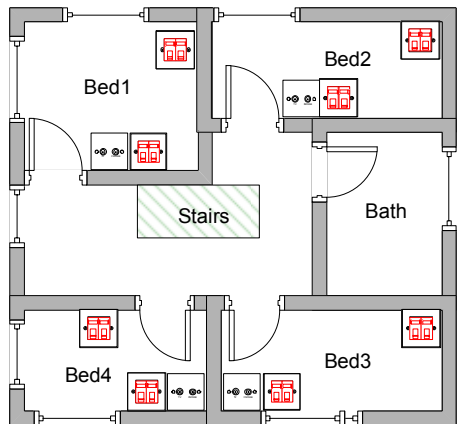
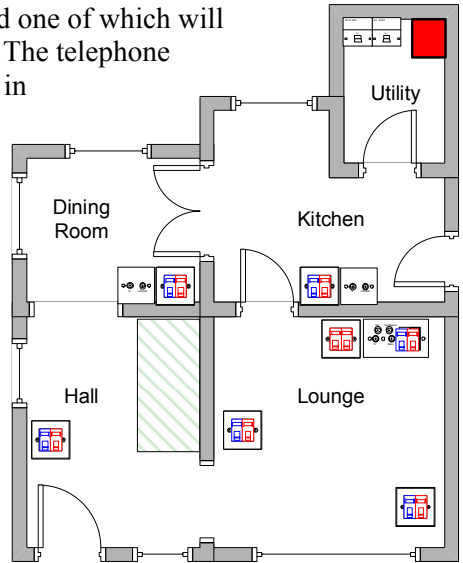
Four Bedroom House

Telephone distribution for 2 lines is required one of which will deliver ADSL broadband into the dwelling. The telephone service will be presented in the utility room in close proximity to the cabinet.

Downstairs wall outlets will provide a mixture of BT and RJ-45 connections. All BT sockets will be connected to one line. The second line will be wired to a single device in one of the bedrooms. A BT Home Gateway ADSL router providing internet telephony and WiFi will be situated in the hall.

Upstairs outlets will provide RJ-45 connections only. Upstairs wired telephones will require a voice converter however the trade off between cosmetic impact / convenience concerns and flexibility lead to this conclusion. Bedrooms one and four are to have voice converters installed.

All main living spaces are to be provided FM and TV signal by the RF distribution system. Accommodation for a Sky Digibox will be made at the main TV viewing location in the Lounge. The ability to use the cabling system for AV distribution and audio source connection is desirable.



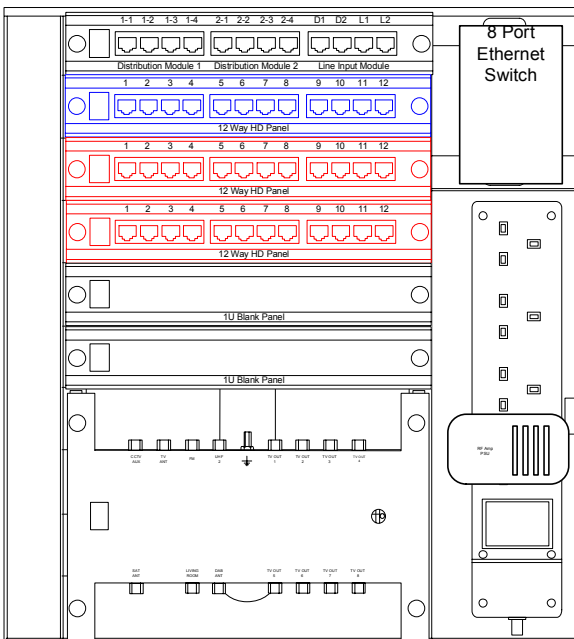
| Cat5e Cabling Plan | | | | | | | | | | |
|--------------------|-------|-----|---------------|-----|--------|----------|-------|-------|----|---------|
| Room & Location | Plate | | Termination** | | | Port No. | | Blnk* | VC | Len (m) |
| | Sgl | Dbl | RJ | BT | Direct | Data | Voice | | | |
| Lounge MSWP | | | 1 E | 1 E | | 1 | 1 | | | 34 |
| Lounge TV | 1 | | 2 C | | | 2, 3 | | | | 22 |
| Lounge Window | 1 | | 1 C | 1 C | | 4 | 2 | | | 22 |
| Lounge Internal | 1 | | 1 C | 1 C | | 5 | 3 | | | 24 |
| Kitchen | 1 | | 1 C | 1 C | | 6 | 4 | | | 16 |
| Dining Room | 1 | | 1 C | 1 C | | 7 | 5 | | | 20 |
| Hall | 1 | | 1 C | 1 C | | 8 | 6 | | | 28 |
| Bed 1 Window | 1 | | 2 C | | | 9, 10 | | | | 10 |
| Bed 1 Internal | 1 | | 2 C | | | 11, 12 | | | 1 | 12 |
| Bed 2 Window | 1 | | 2 C | | | 13, 14 | | | | 8 |
| Bed 2 Internal | 1 | | 2 C | | | 15, 16 | | | | 12 |
| Bed 3 Window | 1 | | 2 C | | | 17, 18 | | | | 16 |
| Bed 3 Internal | 1 | | 2 C | | | 19, 20 | | | | 20 |
| Bed 4 Window | 1 | | 2 C | | | 21, 22 | | | 1 | 24 |
| Bed 4 Internal | 1 | | 2 C | | | 23, 24 | | | | 30 |

| Parts List | | | | | | | | | |
|--|----|----|---|--|--|--|--|---|------|
| CCS Single wall plate 008-001-002-06 | 14 | | | | | | | | |
| CCS Double wall plate 008-001-003-06 | | | | | | | | | |
| CCS Cat5e RJ-45mod 008-001-001-09 | | 23 | | | | | | | |
| Euro Cat5e RJ-45 mod 008-001-000-50 | | 1 | | | | | | | |
| CCS Secondary BT 008-001-001-50 | | | 5 | | | | | | |
| Euro Secondary BT 008-001-000-80 | | | 1 | | | | | | |
| CCS 1/4 Blank 008-001-001-50 | | | | | | | | | |
| CCS Voice Converter 007-006-003-15x | | | | | | | | 2 | |
| Cat5e Cable – 305m box 001-003-003-62 | | | | | | | | | 298m |

NOTE: * Each empty space requires two blanks.
 ** Specify Euro RJ-45 / BT modules for Euro wall plates including the Double Triplex TV plate.
 Select CCS modules if specifying the plates listed above. Remember to consider this difference when totaling for the parts list.

Cabinet Planning

| Part No. | Description | U Space | Qty |
|----------------|--|---------|-----|
| 009-003-001-02 | 2 Line Telephone Service Panel | 1 | 1 |
| 009-001-016-00 | 12 Way Enhanced Cat5 Patch Panel Black | 1 | |
| 009-001-016-04 | 12 Way Enhanced Cat5 Patch Panel Blue | 1 | 1 |
| 009-001-016-08 | 12 Way Enhanced Cat5 Patch Panel Red | 1 | 2 |
| 009-003-002-01 | TV Distribution Panel | 4 | 1 |
| 009-001-021-08 | 1U Blank Panel | 1 | 1 |
| 009-001-020-00 | 1U Brush Panel | 1 | |



Cabinet Layout Notes

The ADSL router is to be installed in one of the rooms. An 8 port switch is required in the cabinet.

The Router connection kit is required to provide required micro filters and link leads.

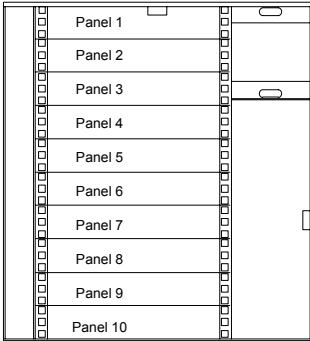
The distribution modules will be patched together due to the number of telephone connections required.

The 2nd line needs to be patched to the outlet in Bed 4 with the voice converter.

NOTE: Each U position has been marked to aid planning. Either write in the item planned for each space or alternatively cut out the component symbols on page 35 and position as required.

| Additional Hardware | | |
|---------------------|---|-----|
| Part No. | Description | Qty |
| 010-100-100-08 | 8 port LAN Switch | |
| CABLEKIT | Router connection kit 2 * secondary Voice Converter, 2 * Micro filter, 1 * BT / RJ-45 Link Lead, 1 * RJ-11/ RJ-45 Link Lead | |
| VELCROKIT | Velcro fixing kit | |
| 009-000-001-00 | Individual Cage Nut | |

Cabinet Panel Outlet Assignment



| No | Description |
|----|--|
| 1 | <i>Telephone service panel</i> |
| 2 | <i>Telephone wall outlet patch panel</i> |
| 3 | <i>RJ-45 wall outlets</i> |
| 4 | <i>RJ-45 wall outlets</i> |
| 5 | <i>Blank</i> |
| 6 | <i>Blank</i> |
| 7 | <i>RF Distribution System</i> |
| 8 | <i>RF Distribution System</i> |
| 9 | <i>RF Distribution System</i> |
| 10 | <i>RF Distribution System</i> |

| Port No. | Panel Number | | | | |
|-----------------|--------------|----------------------------|-----------------------|-----------------------|---|
| | 1 | 2 | 3 | 4 | 5 |
| 1 | | <i>Lounge TV / Sky box</i> | <i>Lounge TV</i> | <i>Bed 2 Window</i> | |
| 2 | | <i>Lounge Window</i> | <i>Lounge TV</i> | <i>Bed 2 Window</i> | |
| 3 | | <i>Lounge Door</i> | <i>Lounge TV</i> | <i>Bed 2 Internal</i> | |
| 4 | | <i>Kitchen</i> | <i>Lounge Window</i> | <i>Bed 2 Internal</i> | |
| 5 | | <i>Dining Room</i> | <i>Lounge Door</i> | <i>Bed 3 Window</i> | |
| 6 | | <i>Hall</i> | <i>Kitchen</i> | <i>Bed 3 Window</i> | |
| 7 | | | <i>Dining Room</i> | <i>Bed 3 Internal</i> | |
| 8 | | | <i>Hall</i> | <i>Bed 3 Internal</i> | |
| 9 | | | <i>Bed 1 Window</i> | <i>Bed 4 Window</i> | |
| 10 | | | <i>Bed 1 Window</i> | <i>Bed 4 Window</i> | |
| 11 | | | <i>Bed 1 Internal</i> | <i>Bed 4 Internal</i> | |
| 12 | | | <i>Bed 1 Internal</i> | <i>Bed 4 Internal</i> | |
| Room / Location | | | | | |

| Port No. | Panel Number | | | | |
|-----------------|--------------|--|---|---|----|
| | 6 7 | | 8 | 9 | 10 |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| Room / Location | | | | | |

Frequently asked questions

Q. My equipment does not have a connector on it that one of your patch cables will connect to. I can not get a cable that links my equipment to the home cabling system.

A. Where direct support is not available there is normally a need to supplement the equipment with a converter which conditions the signals in such a way as to provide successful transmission on this type of cabling

Q. My telephone / modem / fax has the wrong type of plug for the wall outlet sockets. What can I do?

A. Firstly make sure that you have the ability to distribute a telephone line using your home cabling system. If so, choose a wall outlet in a room which is patched into the telephone service at the cabinet and connect a voice converter to the outlet. Connect the equipment into the BT socket provided by the voice converter.

Q. My ADSL router has a smaller version of an RJ-45 and looks like it will connect to a RJ-45 socket, is this ok?

A. No – the smaller RJ-11/RJ-12 will damage the RJ-45 socket. If you are connecting an ADSL router you will need to use a voice converter into which you then connect a standard micro filter. This will then give you the correct connector for your router. Alternatively it is possible to purchase RJ-45 to RJ-11/12 converters.

Q. I can not get TV signal from any of the TV wall outlets in any room other than the living room.

A. Check to see if anything is connected to the Sat2 / Return connection on the wall outlet situated in the main TV location. If nothing is connected to this socket there is no RF signal being fed to any of the rooms and this is the problem. You need to connect the incoming RF signals to the Sat2/Return connection. Either connect the RF2 output from your Sky™ DigiBox to Sat2/Return or, if not using Sky, you will need to use a ‘Y’ splitter to allow connection of the terrestrial signal to both the TV and the Sat2/Return connection.

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