

A introduction to satellite television



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Satellite television first the consumer market in the early 1990s. Dishes made for the average household were expensive and took up a lot of space in the garden. In the first few years of satellite TV only the wealthiest, or more 'die-hard' fans of television, would go to the trouble of buying and setting up a satellite dish. Satellite television was also a lot harder to get than cable or broadcast TV.

In the present day you see satellite dishes on the rooftops of most homeowners in the UK and indeed the rest of the western world. The major satellite TV companies are getting more and more people to buy their product with promises of films, sports and especially news from around the world. The advancement into high-definition televisions and being able to get a high definition satellite signal has made it even more prominent.

Satellite Television gives us many solutions to the problems that come with broadcast TV and, although not perfect itself, is now the main way to view television.

In its basic form satellite television is a lot like broadcast television. They are both a wireless system for delivering television programming to a viewers house. And they both use satellite stations to transmit programming via a radio signal.

Using powerful antennas broadcast stations transmit radio waves to the area surrounding them. The viewers, however, pick up the signal with a much smaller antenna. Broadcast television works fine it just has one massive drawback, which is range. When a broadcast antenna shoots out a radio signal it is shot out in a straight line. To receive these signals you have to be

in the direct line of sight of the antenna. If you are not the signal may become distorted. Small obstacles such as trees or small buildings should not be a problem but bigger obstacles, such as planet earth, would pose a problem. If you transmitted a broadcast signal over a perfectly flat surface you would be able to pick up a signal thousands of miles away from the source. However in the real world the curvature of the planet distorts and blocks the signal sent out from the satellite, to get a perfect signal you would have to be close to the antenna with no obstacles in between.

The Satellite TV Solution

Satellite TV solves this problem by transmitting signal from satellites orbiting the Earth. Because these satellites are so high in the sky it means there are a lot more customers in range and line of sight. Satellite TV systems transmit and receive radio signals using specialized antennas called satellite dishes.

Diagram of how Satellite TV works

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When the satellites that broadcast these radio signals are sent up in to space they are all sent up in geosynchronous orbit. This means that they all stay in one place in the sky relative to the Earth.

Some facts:

Every satellite is launched into space at 7000mph

Each one reaches about 22, 200 miles above the Earth.

When the satellite is this high and moving at such a speed it will revolve around the Earth once every 24 hours, keeping it in the same position above the Earth giving constant signal to the viewer with uninterrupted signals.

The Components of Satellite TV

In a DTH (direct to home) or DBS (direct broadcasting) satellite system there are five major components. These are the programming source, the broadcast center, the satellite, the satellite dish and the receiver.

Programming source – this is where the channels that provide the programmes are based. This is where the satellite TV providers go to pay other companies (for example MTV or Nickelodeon) for the right to broadcast there programmes through their satellites.

Broadcast Center – The broadcast center is central part of the system. In the broadcast center the people who are providing the TV to the viewers at home receive signals from different programming sources and then beam a broadcast signal to satellites to geosynchronous orbit.

Satellites – The satellites in space receive the signal sent from the broadcast center and beam them back down to Earth.

Dish – The viewer then picks up this rebroadcasted signal and the satellite dish passes it onto the receiver in the house.

Receiver – All the receiver then has to is process the signal and pass it on to a standard TV.

This is a very good system to providing a good quality signal to a large area. It has very picture display and sound quality with hundreds of channels and the service is ready to use in rural and urban areas and provides a lot of access to digital and high definition programming. However satellite is not without its drawbacks. It can be quite expensive to buy all the equipment at the outset (satellite dish and receiver etc) and if you want to access satellite television in multiple rooms in your home be prepared for the extra cost. As well as this satellite television can be subject to extreme weather conditions.

Satellite TV signals

Satellites signals have a very long way to travel before they appear on your TV screen. Because of this and because they contain very high-quality digital data it would be near impossible to transmit them without compression. Compression is defined, in this case, as removing all unnecessary or repeated information. After the signal is transmitted it is reconstructed.

Satellite TV has to use a very unique type of video file compression standardized by the 'Moving Pictures Experts Group' or MPEG for short. This allows the provider to successfully transmit significantly more channels than without using this method of compression.

MPEG standards exist to promote interoperability among your computer, television and hand held video and audio devices. These MPEG standards are:

MPEG-1: this is the original standard. It is used for encoding and decoding streaming video and audio files.

MPEG-2: this standard compresses files which are used and transmitted for a high quality of video and is the standard for digital television.

MPEG-4: the function of this standard is to compress high definition video onto a smaller scale so you can stream it to computers, mobile phones and PDAs.

MPEG-21: This standard basically interprets digital content so that the media plays flawlessly no matter what machine it is, what language it is in or the user conditions. It is also referred as the 'Multimedia Framework'.

Most satellite TV providers used to use the MPEG-2 standard to compress their signals but changed to the MPEG-4 standard of compression. This is because MPEG-4 is more efficient at encoding can provide a much greater bandwidth than MPEG-2. However MPEG-2 still remains the official standard for digital television. This is because it is more able to analyse static images, like those you would see in such programmes like talk shows or newscasts whereas MPEG-4 is better at analysing moving, dynamic images. MPEG-4 can do this through such things as spatial[1]and temporal[2]compression. This is how satellite TV manages to provide such a high quality picture of fast-moving objects on the screen, that are always moving, like in a football game.

Satellite Dish

When the signal reaches the viewers house it is captured by the satellite dish. The satellite dish is made up of an aparabolic (bowl-shaped) surface and a central feed horn. The signal passes through the horn and then the dish focuses the signal into a narrow beam.

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This receiving dish works in the exact opposite way to the transmitter as it can't transmit information, it can only receive it. The dish acts just like a concave mirror in that the shape of the dish reflects the signal inward onto a particular point just like a concave mirror focuses light onto a particular point.

The dishes feed horn feeds the signal on to the receiving equipment, and if there hasn't been any obstacles between the satellite and the dish there should be a perfect signal coming into the viewers receiver (unless the weather is bad). Before the dish sends the signal to the viewers receiver it amplifies and filters the signal using LNB, or low noise blockdown converter. After this the LNB passes the amplified, filtered signal to inside the house.

Sometimes, in some systems, the dish needs to pick up a signal from two different satellites. Sometimes this may be possible but when it isn't it may compromise the quality of the signal because the dish cannot be aimed at both of the satellites at the same time so either one or both of the signals would be distorted.

Satellite Receiver

At the end of the satellite TV system is the receiver. It has four important jobs:

It takes the encrypted signal and de-scrambles it

It takes the digital MPEG-2 or MPEG-4 signal and changes them into an analog signal so the standard television can recognize

It also has to sort out the individual

As well as this it keeps the providers headquarters up to date with the payments the viewer owes the provider of the satellite television.

Conclusion

After closely studying satellite television and how it works it is clear to me that is much better and more practical then the older normal broadcast television. This is because of the greater range and ' line of sight' that satellites have got rather than the regular antennas which are impeded by the curvature of the earth and even small obstacles. Although satellite television does have some drawbacks I would say it is definitely the way forward in television broadcasting and has already nearly taken over the market.