Satellite TV Technology
How it works and what you can do with different dishes

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How does content get from the broadcast location to my home?

This section will describe, in detail, how content from CNN Headline News’ broadcast center gets to your home. This information is characteristic of how most channels are transmitted from the broadcast location, to the service provider, and then to the home user.
CNN uplinks (sends) their signal to the Telstar 6 satellite located at 93.0° West on Transponder 22. The location of a satellite is given in degrees away from the Greenwich meridian.

This feed has a Symbol Rate of 4 MegaSymbols per second. The Forward Error Correction is set to ¾. This particular channel feed uses the PowerVu © encryption system.
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**93.0° West** – This refers to the location from the Greenwich Meridian. There are only east and west coordinates for satellites (and no north/south coordinates) because all the major TV and Data satellites are at the equator in a geosynchronous orbit (they move around the earth at the same speed the earth moves, therefore appearing to be stationary).
This video shows how a moving big dish system pans the “arc” of satellites located in the Clarke Belt.
CNN uplinks (sends) their signal to the Telstar 6 satellite located at 93.0° West on Transponder 22 which operates at a frequency of 12079 MHz with a Horizontal Polarity.

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Transponder - A combination receiver, frequency converter, and transmitter package, physically part of a communications satellite. Communications satellites typically have between 12 and 24 onboard transponders.
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The use of opposing polarities allows for more bandwidth on the satellite because the same frequency can be reused on a different polarity.

DBS services use Circular Polarization, while other satellite broadcasts on C-band and Ku-Band use horizontal and vertical polarity.
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**Symbol Rate** – This is the “bit rate” of the transmission. As with most data transfer mediums, the receiver must know the rate at which the transmitter is sending information. CNN’s symbol rate corresponds with a 8Mb/s data rate. Most communications satellites have capacity for about 29Ks/s on a transponder.
FEC – Forward Error Correction. Satellite transponders are rather noisy communications channels are therefore subject to a large number of errors when a signal is sent through them. As a result, Forward Error Correction is used, where the transmitter sends error correction information along with the actual signal so that should errors occur, the receiver can re-generate the bit stream. A FEC of \( \frac{3}{4} \) means that for every 3 bits of real data, there is 1 bit of error correction data.

<table>
<thead>
<tr>
<th>3 Bits</th>
<th>1 Bit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stream Data</strong></td>
<td><strong>EC info</strong></td>
</tr>
</tbody>
</table>
Stream Decrypted and Decoded → Stream re-encoded and multiplexed → Stream Encrypted

The stream is decrypted and decoded by the service provider’s equipment, where it is then re-encoded and multiplexed with other channels before being encrypted and up linked to the satellite that the home user points the dish at.
Section 1: Satellite TV Terminology and Broadcast Diagram

- **Encryption** – Nagravision®
- **Stream Type** – DVB
- **Satellite (for CNN channel)** – Echostar 7 (119.0° West)

Transponder – 16
Frequency – 12.443 GHz (DBS Band)
Symbol Rate – 20000 Ks/s
FEC – 5/6
SID – 202
VPID – 4898
APID – 4899 (English)

The information provided from this slide forward until the end of this section is DVB specific. Dish Network, Bell ExpressVu, and almost every European Satellite service uses the DVB standard for Video, Audio, and Data transmissions via satellite.

**SID** – Service ID
**VPID** – Video Packet Identifier
**APID** – Audio Packet Identifier
Section 2: DVB and Conditional Access

PCI DVB-S cards are able to receive and display DVB MPEG2 satellite signals, such as the FTA channels. With the appropriate hardware CAM module, they are also able to decode subscription TV-services that use the DVB standard.
FTA (Free to Air) Channels

FTA channels on C-Band and Ku-Band use Vertical and Horizontal Polarity instead of Circular Polarity which DBS systems use.
C-band reception requires at least a 7.5ft dish. Many feeds are available on c-band including feeds of TV shows before they air on the networks.

<table>
<thead>
<tr>
<th>Program</th>
<th>Time</th>
<th>Channel</th>
<th>Rating 1</th>
<th>Rating 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 (Clean)</td>
<td>TU 0330</td>
<td>T5/13</td>
<td>6.2/6.8</td>
<td></td>
</tr>
<tr>
<td>Alias (Clean)</td>
<td>SA 2100</td>
<td>G4/17</td>
<td>5.8/6.2</td>
<td></td>
</tr>
<tr>
<td>Bernie Mac (Clean)</td>
<td>WE 0400</td>
<td>T5/13</td>
<td></td>
<td>(020918)</td>
</tr>
<tr>
<td>CSI (Clean)</td>
<td>TH 0100</td>
<td>T6/24</td>
<td>5.8/6.2</td>
<td>(030313)</td>
</tr>
<tr>
<td>CSI: Miami (Clean)</td>
<td>FR 1600</td>
<td>T6/04</td>
<td>5.8/6.2</td>
<td>(030214)</td>
</tr>
</tbody>
</table>
Section 5: Tips for getting equipment

**Ku-Band Equipment:**
- 60cm – 120cm Dish (18" -45")
- LNBf – LNB + Feedhorn (with H/V polarity)
- Receiver – Set Top Box or DVB-S card
- Total Cost - $250 new for a basic setup

**C-Band Equipment:**
- 7.5ft -12ft Dish – Preferably Mesh
- Feedhorn – Located at the focal point of the dish
- LNB - converts the downlink frequency
- Skew Motor – Controls the feedhorn’s polarity
- Actuator – Moves the Dish
- Analog Receiver – Set Top Box
- Digital Receiver – Set Top Box or DVB-S card
- Total Cost - $1000-$2500 new for a basic setup
- $50 - $500 used for a good setup

**Vendors:**
- [http://www.skyvision.com](http://www.skyvision.com)
  Pricey, but high quality products.
- [http://www.dvbmastner.com](http://www.dvbmastner.com)
  Sells DVB Related items.
- [http://www.dvbcanaada.com](http://www.dvbcanaada.com)
  Sells DVB Related items.
- [http://www.ebay.com](http://www.ebay.com)
  Buy your big dish here.
- [http://www.sadoun.com](http://www.sadoun.com)
  Sells Ku and DVB equipment.
Section 6: Other Information

Thanks to Rod Hewitt of http://www.coolstf.com/mpeg for graciously letting me use information from his website. For detailed information on MPEG broadcasts via satellite, check out his website.

Greets to the SLC2600 Crew and www.geeksyndicate.net

North American Free To Air Channels
http://www.sadoun.com/Sat/Channels/North_America_Free_TV.htm

Digital MPEG Information

Mr. Video’s Wildfeed List
http://www.vidiot.com/wildfeed.html

DVB Forums
http://forums.dvbnetwork.com

Dr. Dish’s Satellite Espionage
http://www.drdish.com/features/

Basic Broadcast Information
http://www.internetcampus.com/tvp065.htm