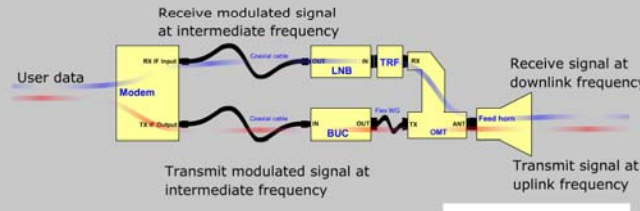
ITSO Trinidad Training Workshop
Supplemental Training Pages

VSAT block diagram

This is the block diagram of the electronic components in a typical VSAT.



Typical modem back panel, showing connections to the user equipment and to the VSAT's outdoor equipment

Typical outdoor electronics of a small VSAT.

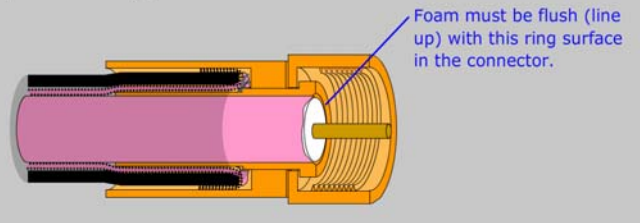
Installing crimp connectors on RG-6 quad-shield cable

Cables14 © 2008 SatProf, Inc. en

- ☐ Why proper termination is important
- ☐ RG-6 quad cable
- ☐ Connectors
- ☐ Tools: Cable cutter
- ☐ Tools: Cable trimmer
- ☐ Tools: Crimper
- ☐ Cut the cable square
- ☐ Trim the cable
- ☐ Strip the cable
- ☐ Fold back braids and outer foil
- ☐ Push connector on
- ☐ Crimp
- ☐ Check center conductor
- ☐ Inspect your work
- ☐ Weatherproofing
- ☐ Finished

Push the connector on

Now push the connector onto the coax until the foam is even with the bottom surface of the connector. You may need to hold the connector with a pair of pliers and firmly push the cable into it.



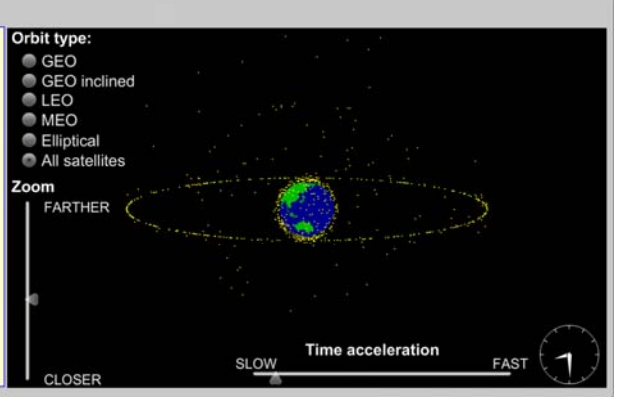
Satellites in orbit

Constellations4 © 2010 SatProf, Inc. en

VSAT's almost always use satellites in "GEO" orbit, which is explained below.

There are other kinds of orbits used for satellites, too. Explore them with this orbit simulator using the buttons and sliders.

As of 2007, there were roughly 850 active satellites in orbit around the earth.

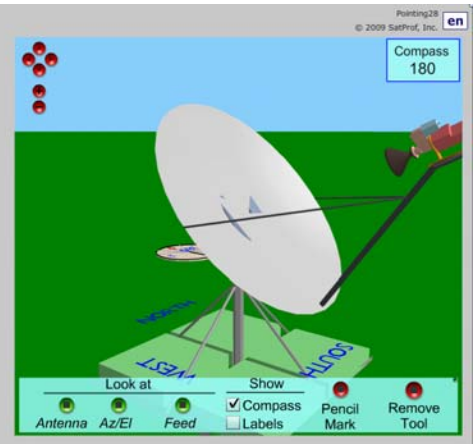


Find the satellite

You have already accurately pre-set the feed polarization and the antenna elevation, so now you are ready to look for the satellite.

Let's use our simulator to step through the process of finding the satellite and doing an initial peak of az and el. The steps are:

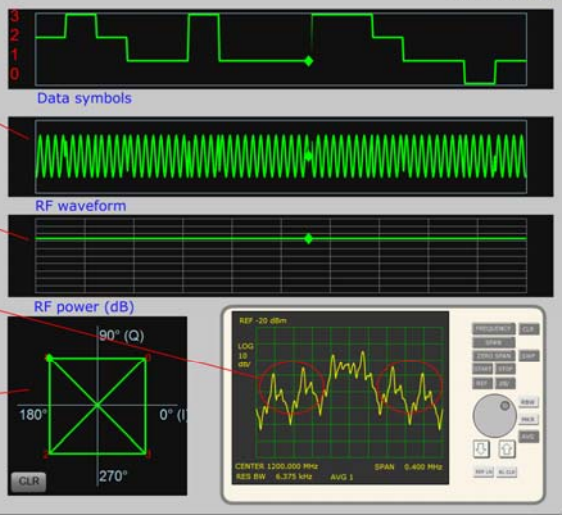
a. Aim the dish towards the expected azimuth.
b. Activate your meter.
c. Find the satellite. Scan coarse azimuth left and right and adjust elevation if necessary until the ID meter shows that you are receiving the correct signal.
d. Peak the signal with coarse azimuth.
e. Tighten the mast clamp bolts.
f. Peak the signal with the elevation adjuster.
g. Peak the signal with the fine azimuth adjuster.



Filtered QPSK

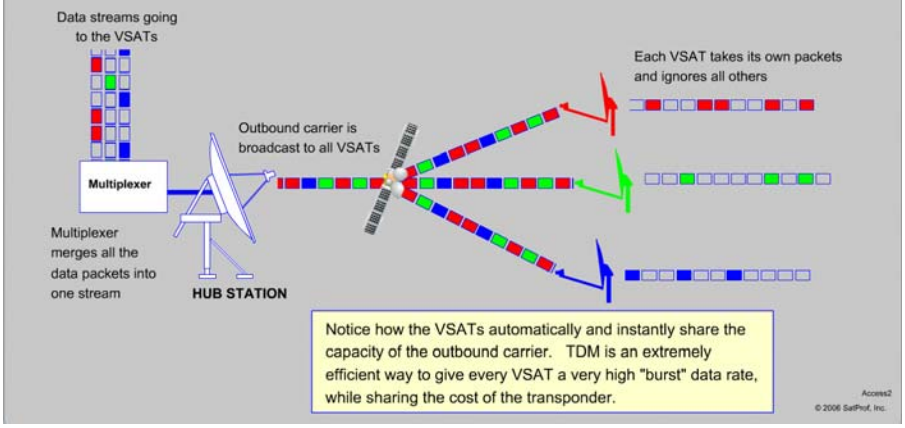
First, lets review unfiltered QPSK.

- The RF carrier waveform has phase glitches whenever the symbol makes a transition, but its amplitude stays constant.
- The RF power level (dB) stays constant.
- The spectrum has very large sidebands, which would obviously interfere with an adjacent channel.
- The polar diagram shows the modulation snapping between the four allowed points.

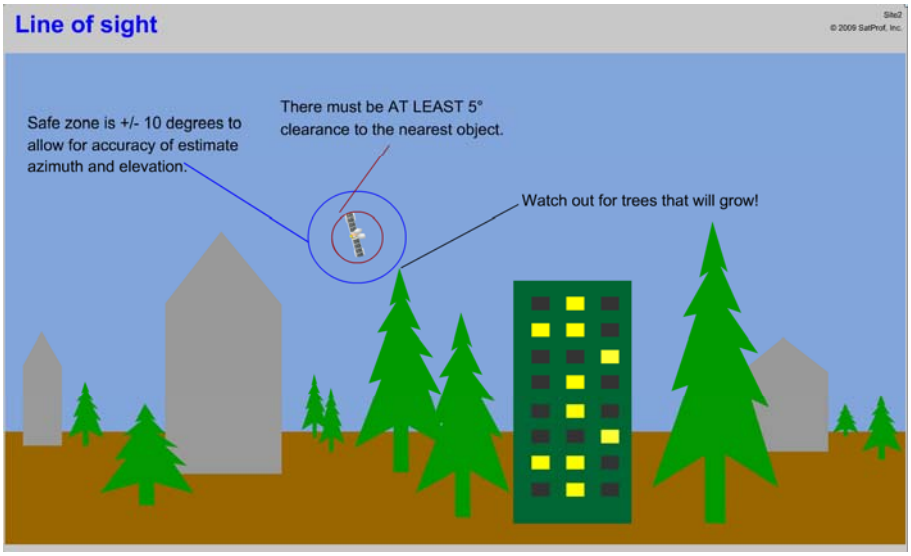


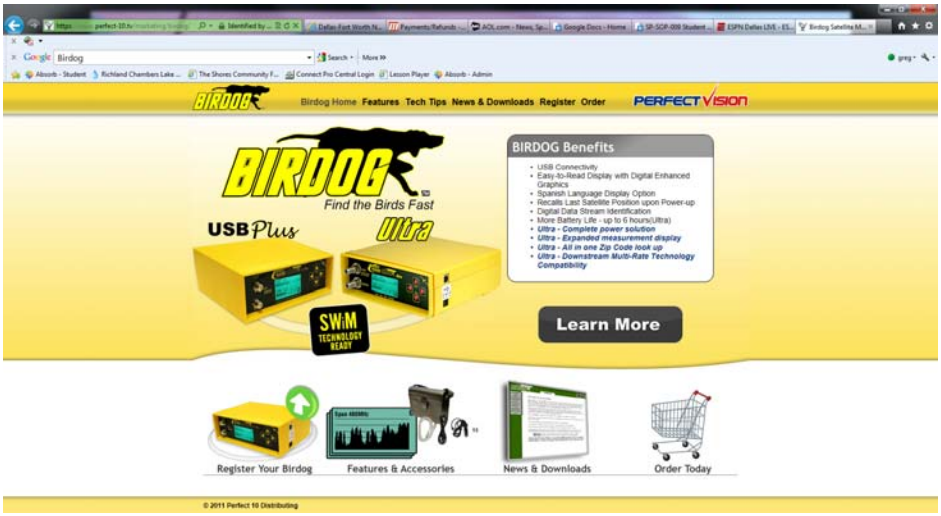
Time Division Multiplexing (TDM)

TDM is a scheme for many VSATs to share one high speed ***"outbound"*** carrier from the hub station.



Line of sight





Example of Signal ID Meter: Birdog

Example of Signal ID Meter: Super Buddy

Example of pointing angle calculations www.dishpointer.com.

Answers to Question Posed In Class

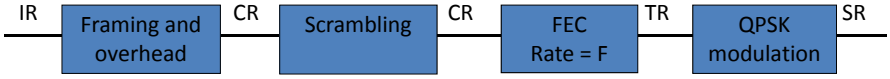
Bit rates and symbol rates

Not used in all modems.

Prevents any repetitive bit patterns from causing spectrum lines. Does not add to the bit rate.

Forward error correction. F is less than 1. E.g. ¾.

1 symbol carries 2 bits.



IR = Information rate

CR = Composite rate = IR * Overhead

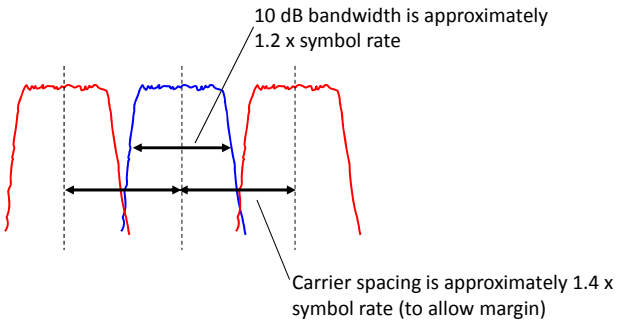
TR = Transmission rate = IR / F

SR = Symbol rate = TR/2 for QPSK

Example using Intelsat IDR format:

IR = 2048 kbps. Framing and overhead adds 96 kbps, so CR = 2144 kbps. FEC: Viterbi rate ¾ and Reed-Solomon rate 15/16; F = 0.703, so TR = 3049 kbps.
SR = 1524 kbps.

Signal bandwidth



- Bandwidth is proportional to the symbol rate.
- Usually, the signal is about 10 dB down at 1.2 x the symbol rate (depends on the rolloff factor).
- Carriers need to be spaced slightly wider than this in order to prevent adjacent carriers from causing interference. Any uncorrelated signal within the demodulator bandwidth appears as excess noise power to the demod, which degrades the bit error rate (BER)
- Traditional carrier spacing is 1.4 x SR, which allows tolerance for some carrier frequency error. With care, carriers can sometimes be spaced a bit closer.