







## ITSO Trinidad Training Workshop Supplemental Training Pages

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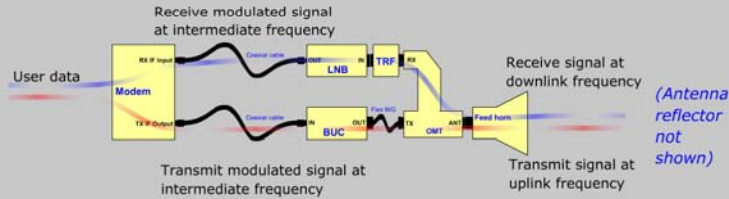





### VSAT block diagram

Blockdiagram1  
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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.



(Antenna reflector not shown)

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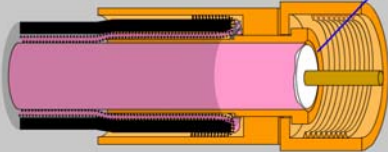


### Installing crimp connectors on RG-6 quad-shield cable

- ☐ 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.



Foam must be flush (line up) with this ring surface in the connector.

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### Satellites in orbit

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.

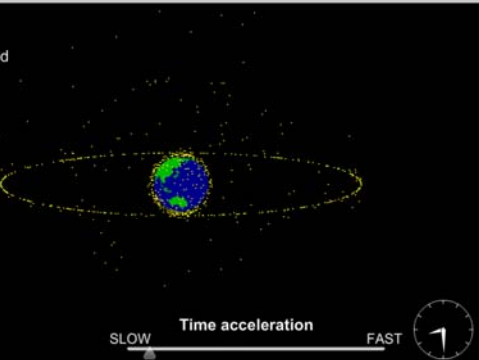
**Orbit type:**

- ☒ GEO
- ☐ GEO inclined
- ☐ LEO
- ☐ MEO
- ☐ Elliptical
- ☐ All satellites

**Zoom**

FARTHER


CLOSER




**Time acceleration**

SLOW FAST

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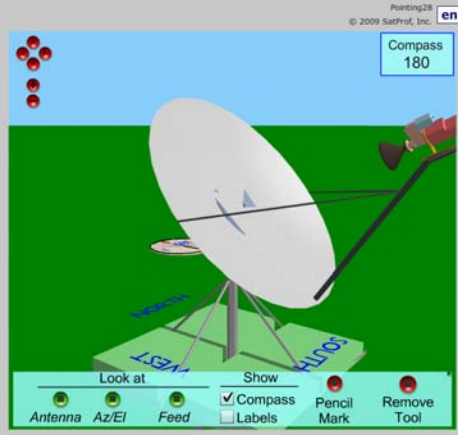


### Find the satellite


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.**



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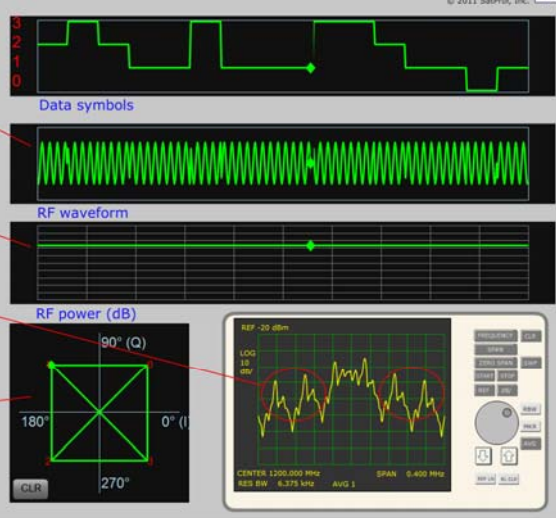





### Filtered QPSK


First, let's 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.



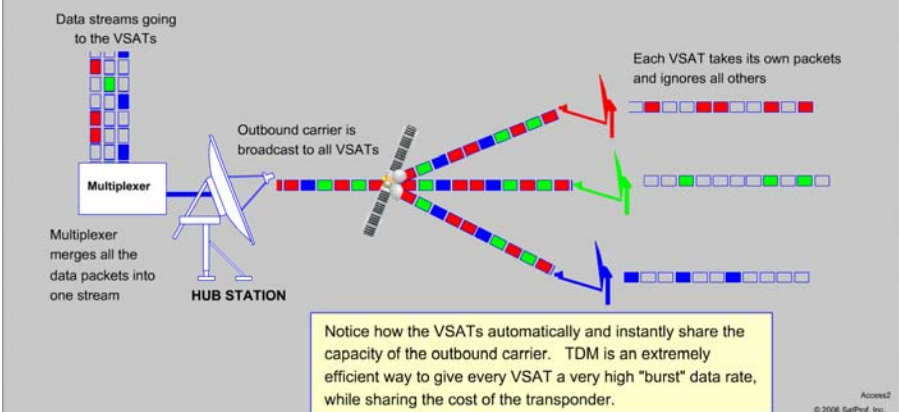
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### Time Division Multiplexing (TDM)


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




Notice how the VSATs automatically and instantly share the capacity of the outbound carrier. TDM is an extremely efficient way to give every VSAT a very high "burst" data rate, while sharing the cost of the transponder.

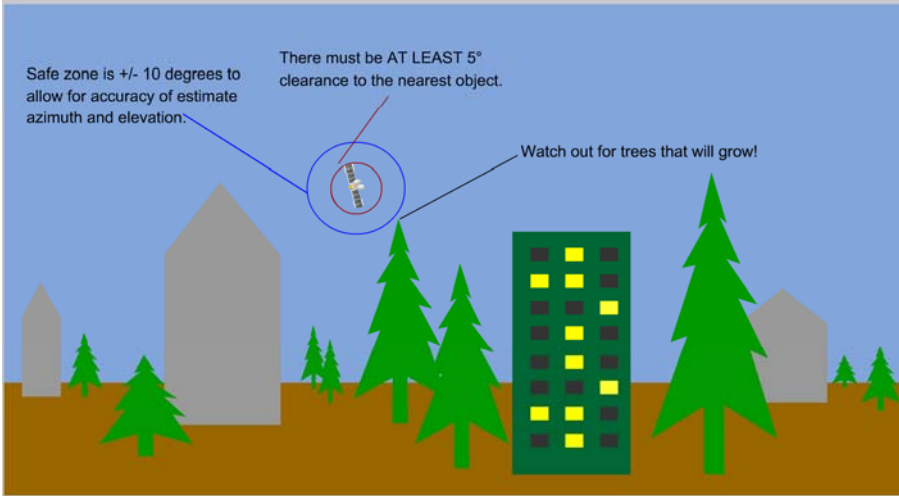
Access2  
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### Line of sight



Safe zone is +/- 10 degrees to allow for accuracy of estimate azimuth and elevation.

There must be AT LEAST 5° clearance to the nearest object.

Watch out for trees that will grow!

Slide 2  
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The screenshot shows the Birdog website with a yellow background. At the top, there's a navigation bar with links like 'Birdog Home', 'Features', 'Tech Tips', 'News & Downloads', 'Register', and 'Order'. The main heading is 'BIRD OG Find the Birds Fast' with 'USB Plus' and 'Ultra' sub-headings. Below this, there are images of the Birdog device and a list of 'BIRD OG Benefits' including USB Connectivity, Easy-to-Read Display, Spanish Language Option, and more. A 'Learn More' button is prominently displayed. At the bottom, there are icons for 'Register Your Birdog', 'Features & Accessories', 'News & Downloads', and 'Order Today'.



Example of Signal ID Meter: Birdog

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The screenshot shows the Super Buddy website. The header includes 'Satellite Solutions The World' and 'SAT PROF'. The main heading is 'SUPER BUDDY satellite signal level meter'. Below this, there's a detailed description of the device's features, including its ability to identify satellites, measure signal strength, and provide real-time data. A central image shows the Super Buddy device. To the right, there's a list of 'Data Sheet' items like 'Detailed Specifications', 'Software Updates', and 'Operation Manual'. A price tag of '\$679' is shown, along with a note about shipping. The footer contains contact information for Applied Instruments, Inc.


Example of Signal ID Meter: Super Buddy

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Satellite Finder / Dish Pointing Calculator with Google Maps

Your location: e.g. streetname, zip code, (lat, lon):  
Port Louis, Trinidad

Most Popular Satellites in 



1. [119W DIRECTV 7S](#) | [ECHOSTAR 14](#) | [ECHOSTAR 7](#)
2. [58W INTEL SAT 16 \(IS-16\)](#) | [INTEL SAT 9 \(IS-9\)](#)
3. [61W AMAZONAS 1](#) | [AMAZONAS 2](#)
4. [61.4W ECHOSTAR 12 \(RAINBOW 11\)](#) | [ECHOSTAR 15](#) | [ECHOSTAR 3](#)
5. [110W DIRECTV 5 \(TEMPO 11\)](#) | [ECHOSTAR 10](#) | [ECHOSTAR 11](#)

[All Satellites](#) | [Motorized Systems](#) | [Multi-NSD Systems](#)





Example of pointing angle calculations  
[www.dishpointer.com](http://www.dishpointer.com).

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Answers to Question Posed In Class

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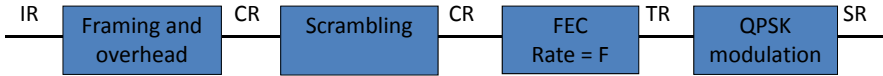
## Bit rates and symbol rates

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.



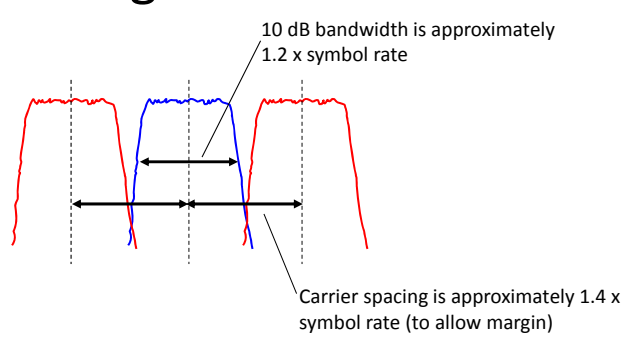
IR = Information rate  
 CR = Composite rate = IR \* Overhead  
 TR = Transmission rate = IR / F  
 SR = Symbol rate = TR/2 for QPSK

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.

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## 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.

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