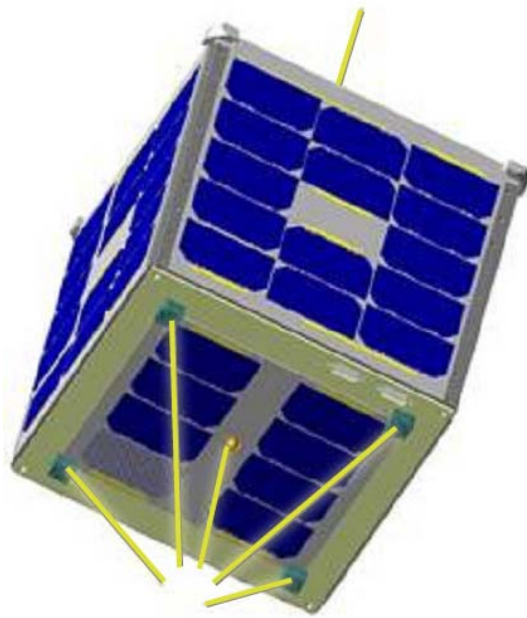


ECHO

From an Operator's Point of View



Adapted from the 2004 Dayton AMSAT Forum talk by Gould Smith, WA4SXM

What is ECHO?

ECHO has the Analog capabilities of UO-14

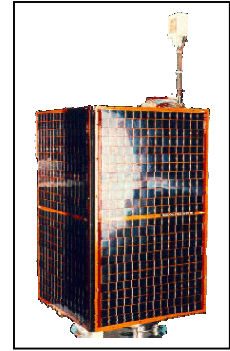
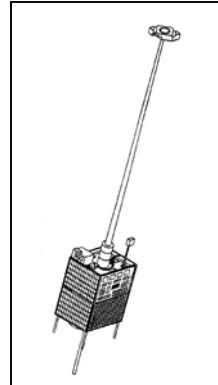
+

The Digital capabilities of UO-22

+

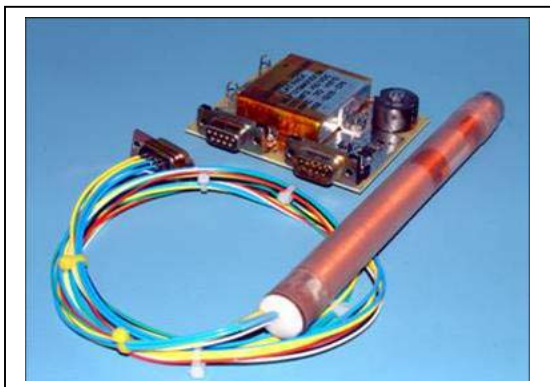
More POWER!

+

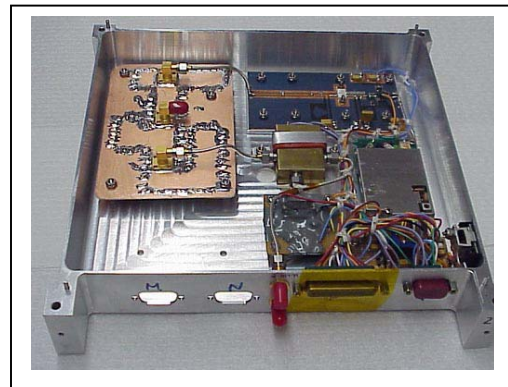


Experiments

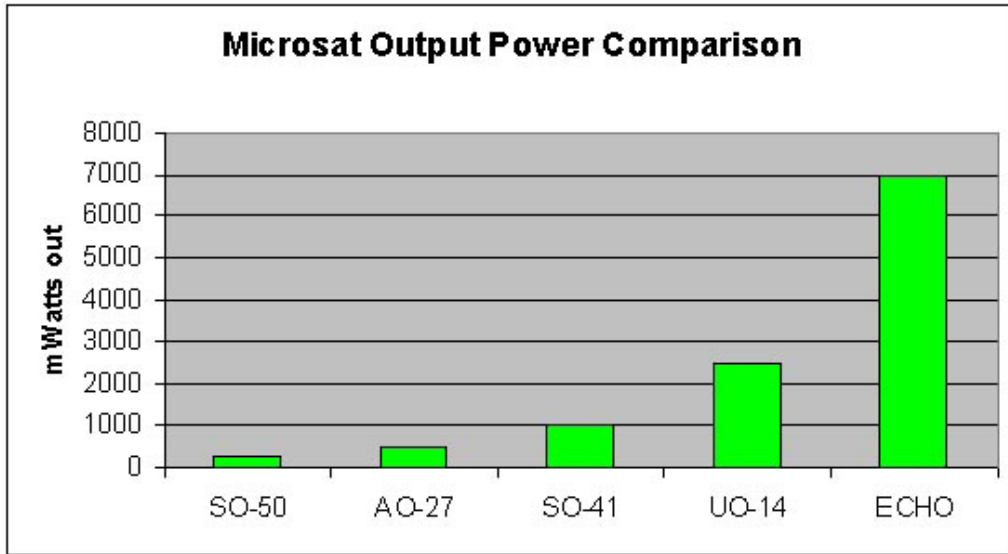
Programmable Torquer



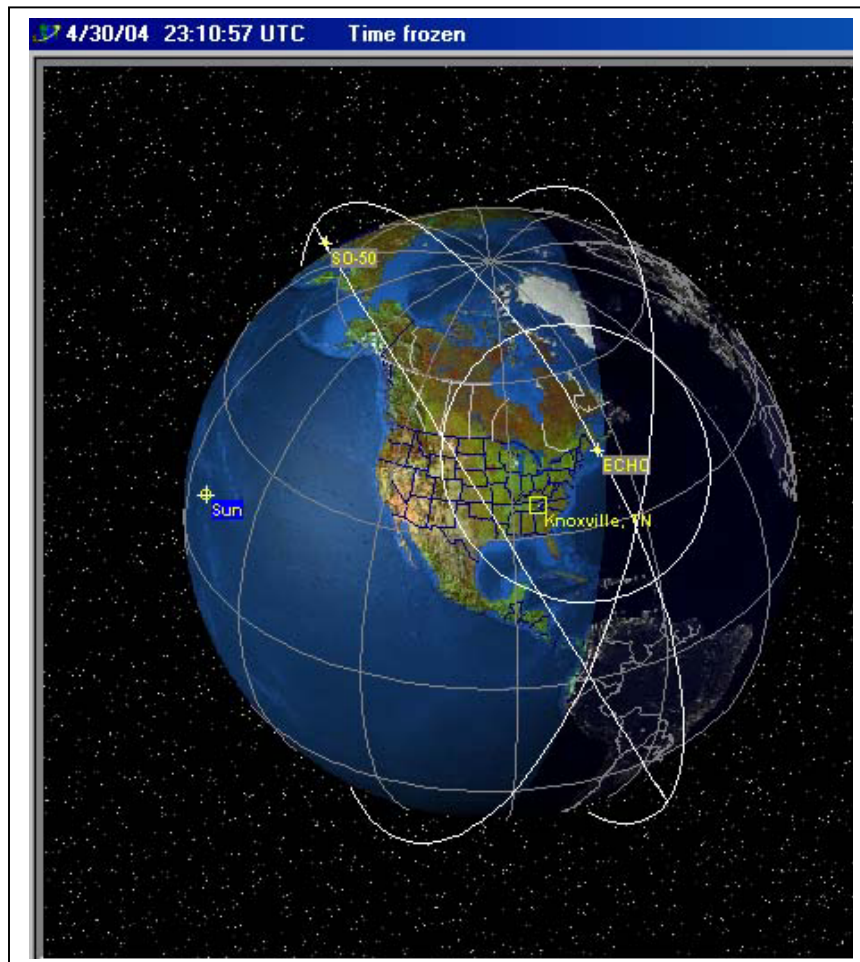
2.4 GHz transmitter



How Much Power?

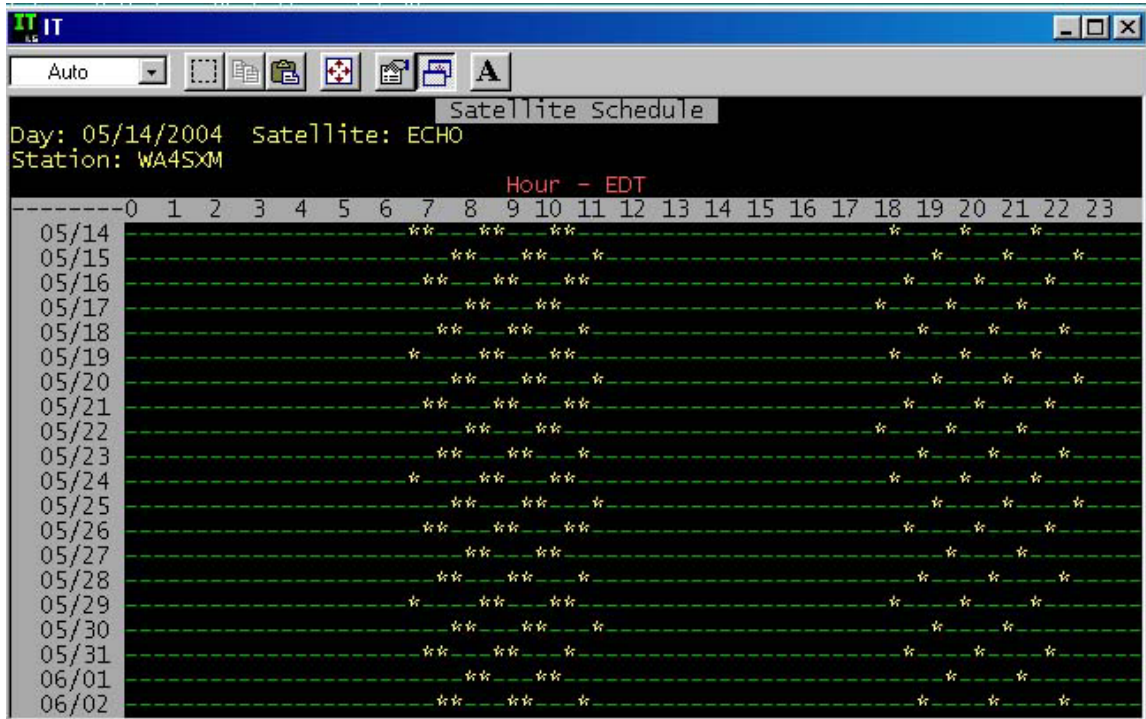


ECHO's Orbit

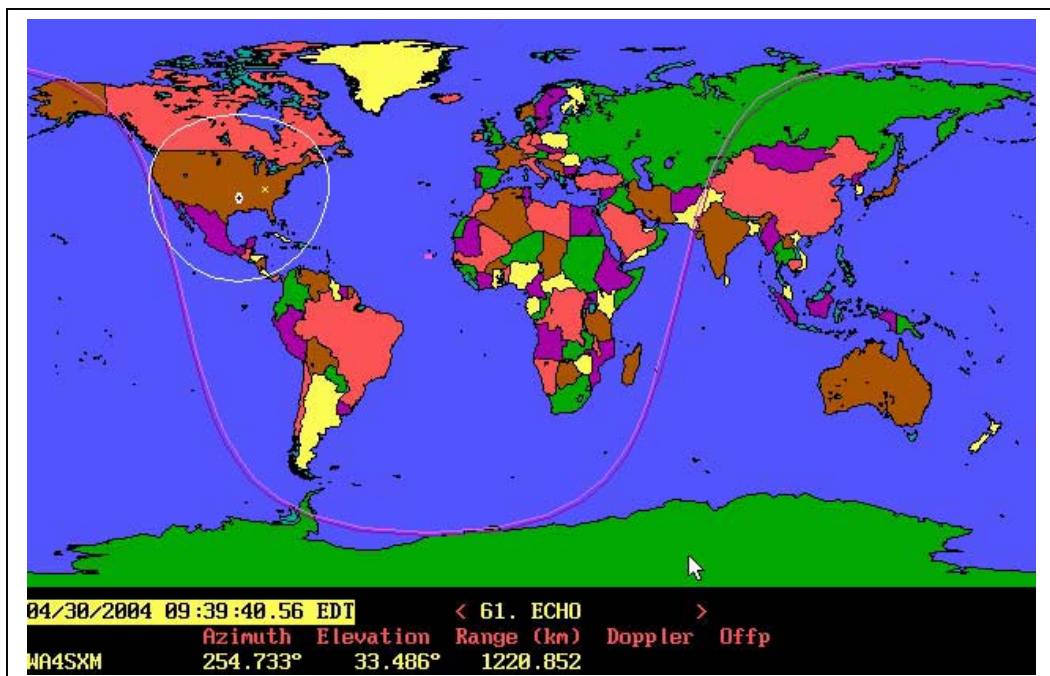


Echo's orbit will be nearly sun synchronous (SSO) – it will cross the same latitude at the same sun time each day.

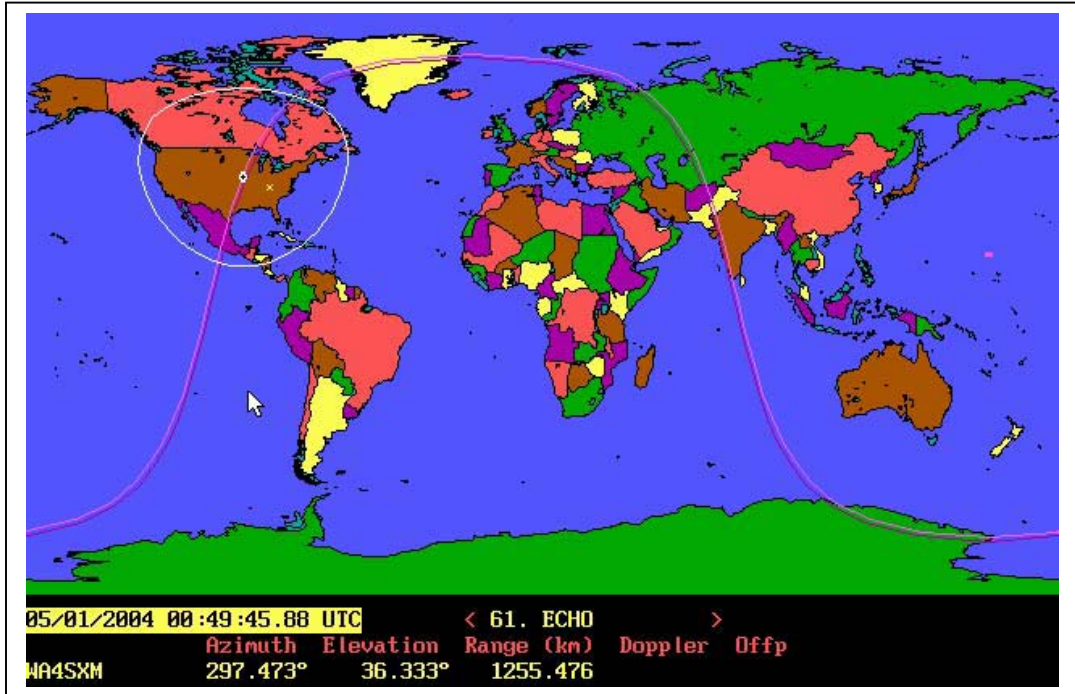
This means that ECHO will appear in the same two windows each day. Below is a pre-launch the expected schedule over the Southeastern part of the US.



The edge of the footprint will follow the sun line for the morning passes.



The evening passes will see the center of the footprint following the sun line.



ECHO's Standard Operating Mode

Analog -

435.225 MHz FM Voice Downlink

145.920 MHz FM Voice Uplink + 67 Hz PL tone

with simultaneous

Digital – 9600 bps, AX.25, PACSAT Protocol mailbox

435.150 MHz FM Downlink

145.860 MHz FM Uplink

and

Telemetry in the digital stream

Standard operations will occur each day except Wednesday.

ECHO Analog Voice Operation

Downlink: 435.225 MHz FM

Uplink: 145.920 MHz FM + 67 Hz tone
(same tone as SO-50)

1-6 Watts out (programmable)

ECHO Digital Operation

Downlink: 435.150 MHz FM

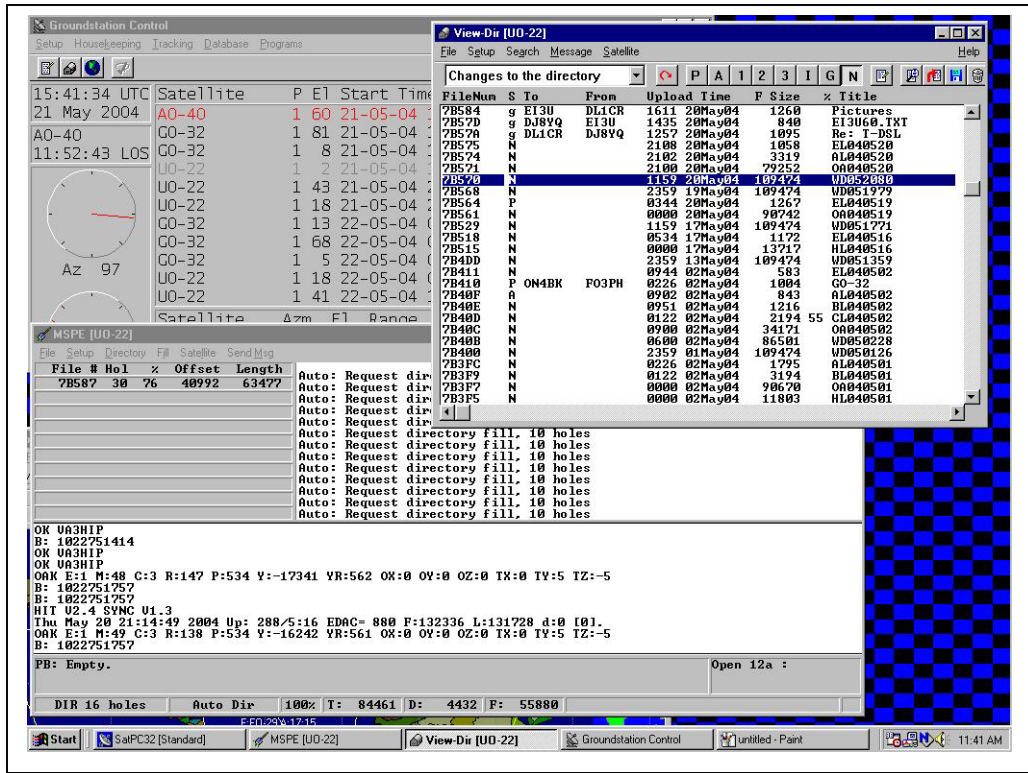
Uplink : 145.860 MHz FM 9600 bps FM,
AX.25 using the PACSAT Protocol Suite (like
UO-22, KO-23/25)

Scheduled 1 Watt output

Store & Forward mailbox + telemetry

WiSP software can manage the S&F mailbox

Below are sample WiSP screen displays for UO-22. Ground stations can use the same equipment to receive ECHO during standard operation as for UO-22.



The digital callsigns for ECHO will be:

ECHO Broadcast callsign **PACB-11**

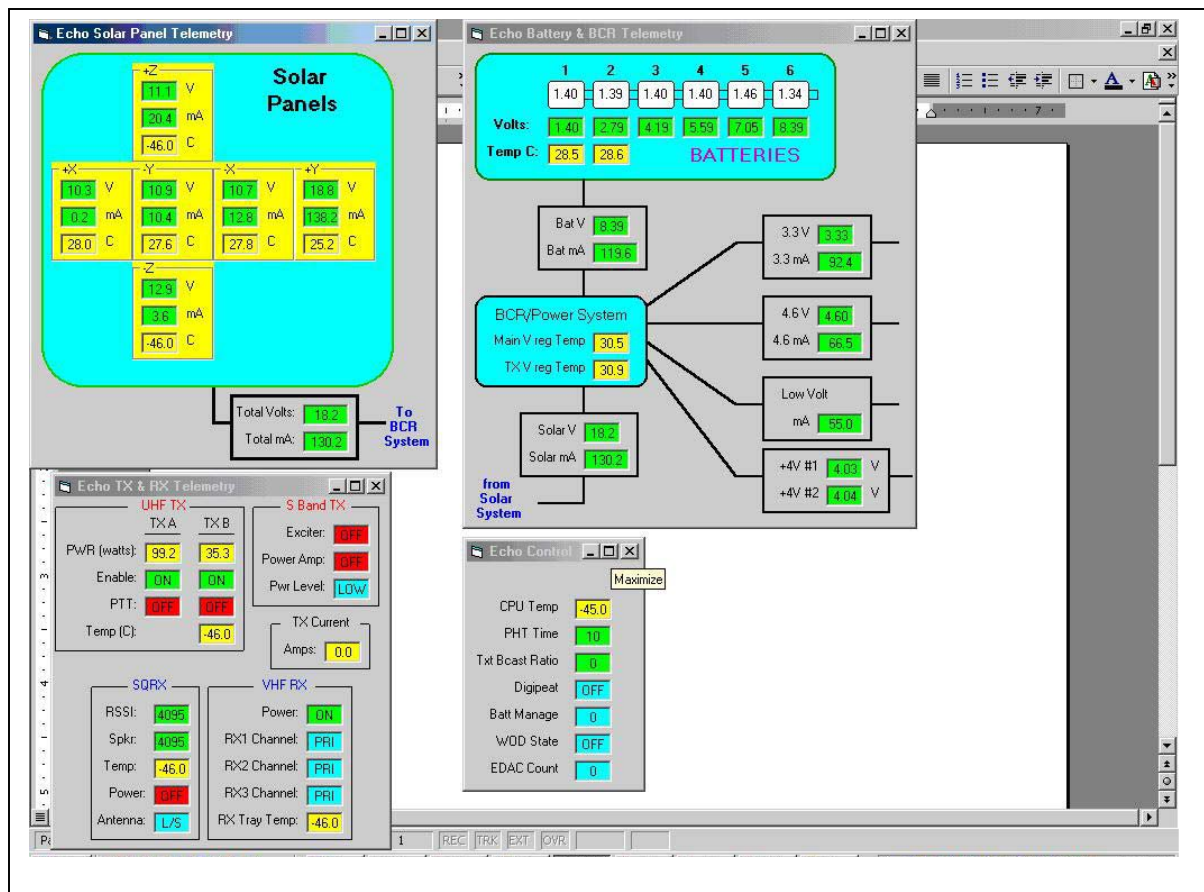
ECHO BBS callsign **PACB-12**

Telemetry

In addition to the digital store and forward mail box, telemetry will be sent down in the digital stream of ECHO. WOD (Whole Orbit Data) will be available as a file that can be downloaded. The telemetry specification is available on the AMSAT web site.

Mike Kingery has developed a telemetry decoding program for ECHO using the Windows OS that will be made available. Those wishing to develop telemetry decoding programs for other operating systems are encouraged to do so.

Preliminary Window decoding screen view of ECHO telemetry by Mike Kingery



ECHO Experimenter's Day Operation

Wednesdays (UTC) 00:00 – 23:59

Default configuration will be:

1268.700 MHz uplink 9600 bps FM

2401.200 MHz downlink at 38.4 kbps FM

The ECHO Operations committee will determine modes and schedules for experiments.

Other experimental modes

FM voice – Modes V/U, L/S, HF/U

Mode V/S, L/U, HF/S are also possible

Digital Store and Forward using 9.6 kbps, 38.4 kbps, 57.6 kbps, 76.8 kbps

PSK 31 Uplink on 10M SSB and downlink on 70 cm FM

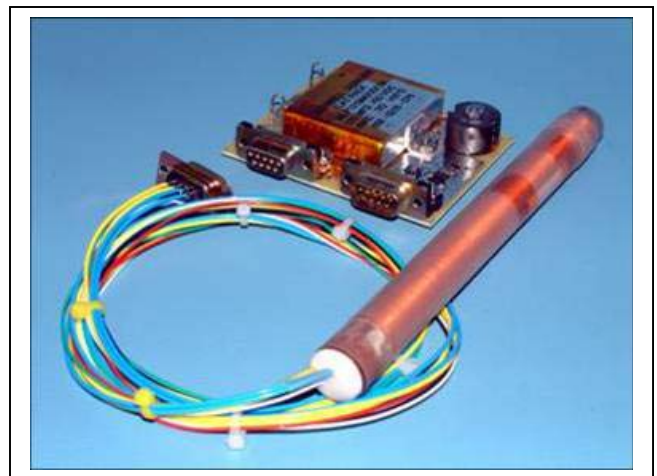
SQRX receiver re-transmissions on UHF using the multi-band, multi-mode receiver capable of receiving between 10 MHz – 1.3 GHz.

APRS status transmissions, sending information up to 20 characters in length

Experiments aboard ECHO

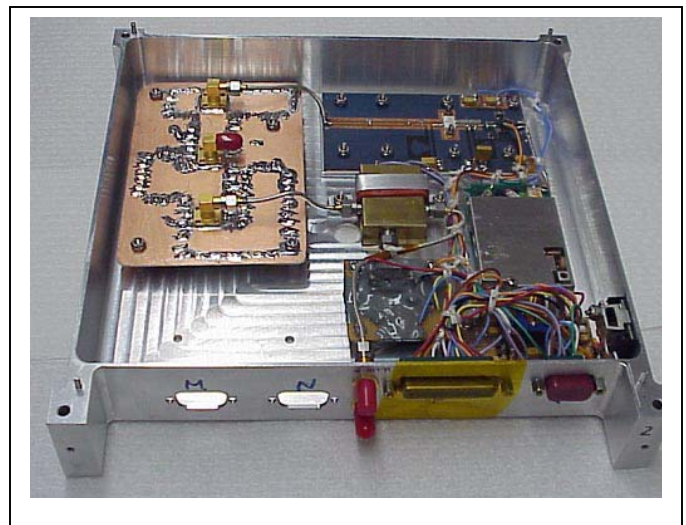
Torquer rod

The torquer rod normally aligns the satellite with the earth's magnetic field. This experimental rod can alter its' charge direction and strength, thus changing the satellite angle or even reversing it.



2.4 GHz transmission

ECHO will use a combination exciter and amplifier to generate the 2.4 GHz transmissions. Stan Wood has also developed a special 1.2/2.4 GHz antenna that will be placed on the bottom (-Z) side of the spacecraft.



ECHO Commissioning

Jim White reports that it will take anywhere between 2 weeks to 2 months to commission the satellite. This depends upon how well the satellite performs in space and how quickly the power characteristics can be determined and controlled.

The commissioning process will begin within hours of launch. When completed, or the satellite is determined to be in stable condition the satellite will be opened for general use.

Much Thanks go to the ECHO Project Team (Rick Hambly, W2GPS, Dick Daniels, W4PUJ and Tom Clark, W3IWI), AMSAT BOD, SpaceQuest, and the many AMSAT volunteers including Jim White, Mike Kingery, Chuck Green, Lou McFadin, Stan Wood, Harold Price, Bob Diersing, Chuck Schultz, Harold Sanderson and Skip Hansen.

Additional ECHO Information

AMSAT has new publication available that is exclusively about ECHO.

Order one today to find out more about:

- ECHO development
- Launch site information
- Launch Vehicle information
- Other satellites launching with ECHO
- Basic commissioning of the satellite
- Specifications and Features of the various components of the satellite
- Additional operational information
- Telemetry information
- Experimental modes
- Experimental projects

